THE GAS JOURNAL

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A Glance at the Contents—

Errors in the Sampling of Coal from Wagons.

Mr. N. Simpkin (of the Lancashire and Cheshire Coal Research Association) dealt with this subject in a paper which he read before the North-Western Section of the Institute of Fuel. [p. 348.]

Advances in the Industrial Uses of Gas.

A paper read by O. Wolff before the 73rd Congress of the German Institution of Gas and Water Engineers deals with various aspects of competition between coal, oil, gas, and electricity. [p. 344.]

Sales Development Representative Required.

Applications are invited for the position of Gas Sales Development and Special Representative for the Birkenhead Gas Department. The commencing salary offered is £260 per annum. [p. 357.]

New " W.-D." Plant in Tasmania.

On March 18 an installation of Woodall-Duckham continuous vertical retorts, having a gas-making capacity of 350,000 c.ft. per day, was inaugurated at the works of the Launceston Gas Company, Tasmania. [p. 342.]

" Domestic Utilization of Gas."

This new book, by Norman S. Smith and R. N. LeFevre, is reviewed by Mr. P. G. G. Moon, Engineer and General Manager to the Bournemouth Gas and Water Company. [p. 343.]

Jubilee of the North Shore Gas Company.

In 1882 the North Shore Gas Company, Ltd., was formed in Sydney. The two works of the Company—one at Neutral Bay and the other at Oyster Cove—are illustrated and described in to-day's issue. [p. 345.]

A Steel Pipe River Crossing.

An interesting 30-in. steel pipe river crossing has been carried out by the Wandsworth and District Gas Company, and, as this embodies one or two unique features, it will doubtless be of interest to our readers. [p. 347.]

Carbonization of Coal with Electricity.

This was the subject of an interesting paper read by Mr. H. S. Walker, Engineer of the Research Department of the Detroit Edison Company, before the 25th Annual Convention of the Canadian Gas Association, held at Winnipeg, June 9 and 10. [p. 350.]

Forthcoming Engagements

Sept. 1.—ASSOCIATION OF STATUTORY METER INSPECTORS.—Annual Meeting in Edinburgh.

Sept. 5-8.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Annual Conference in Blackpool.

Sept. 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Ayr.

Sept. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 10 a.m.; Finance Committee, 10.30 a.m.; Executive Committee, 11 a.m.; Gas Education Executive Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board. There will be no meeting of the Board or of the Central Committee of the Federation of Gas Employers during August.

Sept. 13.—B.C.G.A.—Meeting of the General Committee at 4 o'clock approximately, 28, Grosvenor Gardens, S.W. 1.

Sept. 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Purifiers Sub-Committee, 10.15 a.m.; Gasholders Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 15.—S.B.G.I.—Meeting of Council in the afternoon.

Sept. 19.—INSTITUTION OF GAS ENGINEERS.—Meetings of Calorimeters Sub-Committee, 2.30 p.m.; Sir Arthur Duckham Memorial Fund Exploratory Committee, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Research Committee, 10 a.m.; Liquor Effluents and Ammonia Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Sept. 21.—INSTITUTION OF GAS ENGINEERS.—Meetings of Meters Committee, 10.15 a.m.; Tar Sub-Committee, 12 noon; Committee on the Admittance of Chemists to Corporate Membership, 2.30 p.m., 28, Grosvenor Gardens, S.W.1.

Sept. 22.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Porthcawl.

Sept. 26 to 28.—B.C.G.A.—Annual Conference at Leeds.

Sept. 30.—INSTITUTION OF GAS ENGINEERS.—Meeting of General Research Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 4.—INSTITUTION OF GAS ENGINEERS.—Meeting of Sir Arthur Duckham Memorial Fund Committee, 3 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 7.—NORTH OF ENGLAND ASSOCIATION.—Autumn Meeting.

Oct. 10.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 11.—INSTITUTION OF GAS ENGINEERS.—Meetings of Council, 10 a.m.; Board of Examiners, 12.15 p.m.; Gas Education Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Lighting Committee, 11 a.m.; Gas Appliances Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

1932 "JOURNAL" Directory.

Page 6. BARNARD CASTLE. J. M. Stabler appointed Manager vice J. Shield, resigned.
Page 10. BRAINTREE. R. Lally appointed Manager.
Page 26. FOLKESTONE. W. Griffin, deceased.
Page 38. KIRKHAM. F. Ashton appointed Engineer, Manager, and Secretary vice J. Crook, retired.
Page 86. INVERURIE. W. MacMillan appointed Manager.

EDITORIAL NOTES

Sampling of Dry Slacks

IT is axiomatic that great care has to be exercised in the sampling of wagons of coal. Precision in the laboratory is of no avail unless the sample is representative of the delivery; and nowadays, when more and more attention is being paid to the purchase of coals under contracts embodying penalty clauses, it becomes increasingly important to arrive at some method of sampling which will be satisfactory to both buyer and seller, and which will in fact give a true record of the coal supplied. Investigation on the subject is, of course, by no means new. For years both individual and co-operative research have been undertaken with a view to solving the problems involved; and it is comparatively recently that the British Standards Institution (then the B.E.S.A.) published their now well-known Specification for the Sampling of Coal. While this specification may hold for large coal or washed gradings, it would most certainly appear from the article by Mr. N. Simpkin on later pages of our issue to-day that it is not reliable for the sampling of wagons of dry slack, in that it prejudices the seller to an extraordinary degree—to such an extent, indeed, that the author states that neither a colliery firm nor a consumer would be justified in accepting the analysis for dry slacks obtained by the B.E.S.A. method.

In this matter of sampling, the colliery is in a more favourable position than the consumer, for it is easier to obtain a representative sample of the coal while it is being charged into the wagons than it is from wagons after they have arrived at the consumer's works. The loading of wagons is usually carried out during a time convenient for the taking of samples; on the other hand, discharging or unloading of small consignments is frequently of an irregular nature not conducive to ease of sampling, for which reason the consumer frequently resorts to the practice of obtaining his samples from the tops of the wagons. Mr. Simpkin has carried out a series of tests of the coal samples obtained by taking at definite intervals a representative sample of the stream of dry slack being charged into the wagons; secondly, by the B.E.S.A. Specification, which consist of taking coal from a series of holes dug in the top of the wagon at regular intervals; thirdly, by a "trench" method, a longitudinal trench being dug and one increment being taken from the extreme end, one 2 ft. from the other end, the others being placed evenly between: and, finally, while the wagon is being discharged. The results show clearly that the ash content and the fines are practically identical in the case of the conveyor charging and discharging samples, but higher in the sample from the top of the wagon; and the more the investigation progressed the greater became the evidence that the Standard Specification, or even modifications of the standard method of sampling, does not give satisfactory results with dry slacks. Nor is this a question of the number of increments taken. What applies to one wagon applies with equal force to 50 or 100; the error is a persistent one and does not depend upon the individual wagon sampled. Of course, wagons do differ, and it is not unusual to find fines concentrated at one end of the wagon.

The first series of tests was carried out at the colliery soon after the filling of the wagons, and another series was undertaken at the consumer's works after the wagons, though not having travelled a great distance, had been subjected to considerable shunting. The fuel was sampled at the colliery while the wagons were being charged, and at the works the wagons were sampled individually by both the British Standard Specification method and by the "trench" method. The results proved well enough that the fines had been shaken down. The samples which were taken from the tops of the wagons were not representative of the consignment. The percentage of fines was far too high and the ash content was also far in excess of what it should have been; and it has to be remembered that an undue amount of fines frequently forms the basis of a customer's complaint. The discrepancy may be as much as 5 p.ct. or 6 p.ct. in the ash figure and up to 20 p.ct. or more for the fines. The author concludes definitely that wagon sampling by the Standard Specification yields results which are incorrect and unreliable, since they tell against the seller by showing too high an ash content and too much fines. The only satisfactory method found so far is to sample the fuel by taking increments as the wagons are being filled or emptied. In the latter case, more necessary than in the former, increments must be taken during the whole of the unloading period. This is necessary, as the fuel segregates in each wagon, coarse sizes settling at the bottom and sides during loading, the fines tending to be in the middle and on top. This raises the very interesting point of the possibility of loading slack into wagons so that separation of coarse and fines will not occur.

Art in Industry

DURING the past twenty years much attention has been paid to the application of Science to Industry. Rule-of-thumb methods have given way before scientific methods. Industrialists have accepted the fundamental importance of research and development work if they are to keep to the forefront of their particular branch of production. Even Parliament has taken an interest in Science, and such subjects as low-temperature carbonization have at times been discussed alongside the more prosaic matters of finance and fiscal policy. In a sentence, it may be stated that Industry to-day is "Science Conscious," and the technical man with some progressive idea in mind has never had a better chance of a good hearing than he has to-day. In this appreciation of the value of a scientific basis of industry the Gas Industry stands well to the fore. A comparison of productive methods twenty years ago and to-day is sufficient proof of this statement.

Industry places high value on Science, but we have been wondering whether it pays enough attention to the value of Art as a means of furthering prosperity. These thoughts have come to mind by reason of a visit to the Industrial Design Exhibition organized by the Royal Society of Arts at the Imperial Institute this month. The main feature of this Exhibition is the display of posters submitted for various competitions, the prizes for which were awarded by prominent firms and the Royal Society of Arts. Artists and students from all over the country sent in their ideas for advertising by posters, say, a famous lubricating oil, or meat extract, or dog biscuit. It is particularly illuminating to see thirty different treatments of one subject exhibited side by side, and one cannot but be impressed by the latent power for attractive display work by many of these young artists, most of whom are yet unknown. All the work has been prepared with the view to its being reproduced by colour printing. The many recent improvements in the technique of printing have greatly enhanced the possibilities of artistic treatment. Successful advertising, even in the hands of the artist does not necessarily mean elaboration, and it is noticeable that in certain cases the judges have awarded the prizes to some of the simplest lay-outs.

This is an age of advertisement. Consciously or unconsciously the name of some commodity or some service is being brought to our notice almost every moment of the day. Our morning paper, the packet of breakfast cereal, our journey to town by train, car, or tube, each exposes

us to some advertisement in one form or another. The reaction which any particular advertisement has on us influences us to a large extent in our attitude towards that particular commodity. The best method of approach is therefore a matter of considerable importance to all who have any responsibility in the matter of advertisements.

The point we have in mind is just this. Is there any reason why art in advertising should be bad business? Just as wireless is giving to the millions a knowledge and appreciation of music in everyday life, so the widening of the horizon of the man in the street is giving him a wider appreciation of the values of art in their broadest sense. This tendency can be observed in many directions. The town-planned maisonette with its splash of colour from the small garden, the design and colour of fabrics, the artistry of modern house furnishings, each points to a popular interest in art—for without popular support there would be no progress. Motor transport has widened the horizon of the town dweller, making it more easy for him to appreciate art in its natural form. The cinema has also undoubtedly enormously widened the viewpoint of the people. Twenty years ago it was the privilege of but a few to have seen, say, New York, an African jungle, and the South Sea Islands. To-day many children have definite pictures of these widely scattered lands even before they can read. Is it not at least probable that as the man in the street comes more in contact with the world at large he will gain an increasing appreciation of art?

Turning from these generalizations to our own Industry, in what direction can we encourage art? Probably first of all in the supply of attractively designed fittings and appliances. In this there has been very considerable improvement during the last few years. The improvements in the finish and "lines" of the gas fire have been most important features in establishing popularity in the modern house. The Industry should welcome any efforts to add still further to the artistry of gas equipment.

The second way in which art can be encouraged is in the design and execution of showrooms and exhibitions. In both these directions the Gas Industry already holds a prominent place. But is it not precisely because the aim has been to get an artistic arrangement that so many showrooms remain vividly in mind? A notable example of the application of art to such end is the Central Gas Information Bureau at the British Industries Fair, Birmingham. Gas manufacture, to the average man, is rather a prosaic, dull affair associated with smells, lead pipes, and gasholders. It is only by the showroom that the smartness, applications, and even romance of the Industry can be shown to him.

Thirdly, simplicity of phrase, attractive and balanced lay-out, clear illustration and good printing are all applications of art applied to advertisement; and anyone who thinks that advertisements are a dull subject should pay a visit to Imperial College to view the exhibits which started this train of thought.

Electricity v. Producer Gas

The idea of using electricity for carbonizing coal is by no means new, but for many obvious reasons it has not met with any amount of support in this country, the chief objection being the question of cost. But we have on later pages to-day an account of a new plant of interesting design which employs off-peak electricity to carbonize coal in a plant of a stated capacity of 30 tons. The account of this plant is by Mr. H. S. Walker, of the Detroit Edison Company, and his firm have been responsible for its installation at a gas-works which they acquired twelve years ago and which is responsible for supplying 11,000 consumers. The whole scheme is by its nature a particular one. It could not be translated generally even in America, and it is still less applicable to this country. An idea of the circumstances will be gained from the fact that the Detroit Edison Company have over half-a-million consumers of electricity, or 50 times as many as the gas consumers; and in such a situation they are naturally able to supply off-peak electricity at an extremely low cost for use as a heating medium in their comparatively small gas-works plant. In brief, the load suits them admirably. It is stated that the plant is a thoroughly satisfactory practical proposition, but owing to the inroads of natural gas the process is not being exploited at the present time.

It is more the technical aspect of the plant than the economic which will interest our readers. Electrical energy is passed through a starting fuse—a column of coke breeze in a vertical cylindrical retort. The heat of the fuse is conducted to the adjacent coal, which, when it has become carbonized, is a relatively good conductor of electricity, whereupon the electricity flows not only through the fuse but through the carbonized coal. The rate of coking is fast—a matter of 4 in. an hour on the diameter of the retort being the stated figure. As to the nature of the products—gas, coke, and tar—these are more or less the same as those obtained by high-temperature carbonization, except that the tar more resembles that produced in many low-temperature processes. The yields of all three approximate to those of high-temperature carbonization. One of the chief claims made for the process is its flexibility not only as regards size and types of coal processed, but as to the ease with which the plant can be started up and let down. In several instances, it is mentioned, the retort was started from a cold conditions and in fifteen minutes was producing gas. The actual operating costs are not given—in fact, there is no detailed information which would serve as a guide to the economics of the process. At the same time, claims are made that the capital cost of such a plant should not be greater than a normal gas-making plant, while it is believed that it would be lower; that the maintenance charges should not be higher, and that the operating costs should be either the same or less; and that electricity can compete economically with producer gas for carbonizing coal.

On a Sound Basis

For over a century the firm of Parkinson & Cowan have served the Gas Industry extremely well, and throughout this period have enjoyed a reputation second to none. On later pages of our issue to-day we publish passages from the speech of the new Chairman, Lieut.-Col. H. W. Woodall, at the Annual Meeting of the Company held last Friday. It is a speech which will command the greatest respect, for it indicates a determined effort on the part of the Company to cut out all dead wood and to place its affairs on a thoroughly secure foundation. Though the major portion of the firm's interests depend upon trade in Great Britain, it has important investments in Australia; and it is a widely appreciated fact that no country, during the past two years, has been more severely affected by the general industrial depression than has the Commonwealth. This depression has naturally had its influence on the Company's operations, but it is gratifying to note that conditions in Australia are improving.

The firm of Parkinson & Cowan is equipped with a full measure of technical ability to meet modern demands, and the steps which have been taken during recent months should leave no doubt in the minds of those interested of the ability of the management to bring the concern back to prosperity. It is neither possible nor desirable to deal in these columns with all the moves which are being made, but we call the attention of our readers to two points which we consider of the greatest importance. First, there is the closing down of the operations of one of the Company's Subsidiaries—Domestic Electrification, Ltd.—which is largely responsible for the reduction of the value in investments by the sum of £63,192; and secondly, there is the centralization of Headquarters and other units in the centre of the Engineering Industry in London. We think the belief of Col. Woodall is completely justified—that nowhere will the affairs of the Company be followed with greater sympathy than among its old friends in the Gas Industry.

We end this note by mentioning the sympathetic reference which the new Chairman made to the late Sir Henry Cowan, who was such a well-known personality in the Gas Industry.

PERSONAL

Liverpool Company's New Chairman.

At a meeting of the Directors of the Liverpool Gas Company held on Aug. 10, Dr. GEORGE CHRISTOPHER CLAYTON, M.P., J.P., C.B.E., who has been a Director of the Company since 1922, was appointed Chairman in the place of the late Sir Henry Wade Deacon, J.P., LL.D. Dr. Clayton is the member of Parliament for the Wirral Division of Cheshire, a Doctor of Philosophy of the Heidelberg University, a Director of Imperial Chemical Industries, Ltd., and of the Power Gas Corporation, Ltd. He is President of the Institute of Chemistry of Great Britain and Ireland, and the Representative of the Chemical Industry on the Advisory Council of the Board of Trade. Mr. Alfred Tyrer, the present Vice-Chairman, who has held that office for 11 years will continue in that capacity.

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Mr. W. E. CATON, M.Inst.C.E., M.I.Mech.E., General Manager and Engineer to the Oxford and District Gas Company, has been elected to a seat on the Board.

Mr. J. M. STABLER, of Withernsea, has been appointed Manager of Barnard Castle Gas Company.

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Mr. F. ASHTON, the new Engineer, Manager, and Secretary of the Kirkham Gas Company, in succession to Mr. J. Crook, was chosen out of 96 applicants.

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Mr. WILLIAM MACMILLAN, Assistant Engineer and Manager to the Sanquhar Corporation Gas Department, has been appointed Manager of the Inverurie Gas Company. Mr. MacMillan, who has been at Sanquhar for the past seven years, is the youngest son of Mr. John MacMillan, Engineer and Manager of Sanquhar.

* * *

Mr. JOHN N. THOMSON, who is employed in the drawing office of Messrs. Henry Balfour & Co., Ltd., Gas Engineers, of Leven, has passed in the Gas Supply Examination of the City and Guilds of London Institute, and has been awarded the Institute's Silver Medal for the highest marks in Great Britain. The examinations were held at Kirkcaldy Technical School at which the Lecturer is Mr. Robert J. Gavin, of the Kirkcaldy Corporation Gas Department.

OBITUARY

WILLIAM GRIFFIN.

After an association extending over a great number of years with the Folkestone Gas Company, latterly as Chairman and Managing Director, Mr. WILLIAM GRIFFIN, J.P., died of heart failure at his home, " St. Hilda's," Folkestone, on Aug. 13, at the age of 69 years. Mr. Griffin had been Chairman and Managing Director since the amalgamation of the Folkestone Company with the undertaking of the Tilmanstone Colliery. He was of kindly and genial disposition, and much liked by his colleagues and staff. The funeral took place on Aug. 15 at the Golders Green Crematorium, and a Memorial Service is to be held to-day at Holy Trinity Church, Folkestone.

* * *

WILLIAM WOOLLEY.

After being in failing health for some time, Mr. WILLIAM WOOLLEY, for many years a Director of the Derby Gas Light and Coke Company, passed away at his home Duffield Road, Derby, on Aug. 8. A solicitor by profession, Mr. Woolley had extensive business activities, and had been a Director of the Derby Gas Light and Coke Company since 1902, and was Chairman of the Undertaking from March, 1922, until resigning last December. During his association with the Gas Company, the Undertaking entered on some of the most important stages of its development. The funeral took place at Darley Abbey Church on Aug. 11, and representing the Derby Gas Light and Coke Company were: Alderman Sir John Ferguson Bell, J.P. (Chairman), Mr. E. S. Johnson, J.P. (Director), Mr. C. W. Amey (Secretary), Mr. C. H. Mosedale (Accountant), Mr. R. W. Porter (representing Mr. J. P. McCrea, Chief Engineer), Mr. J. Hopkins (Stores Superintendent), Mr. S. Webster (late Chief Clerk), Mr. R. Fisher (Manager, Litchurch Gas-Works), and Mr. W. H. Oldknow.

* * *

The death has occurred of Mr. HARRY WILKINSON, of Littlethorpe, near Ripon, at the age of 82. Deceased started his career as office boy with the Harrogate Gas Company in 1864, and rose to be Secretary and General Manager. Mr. Wilkinson, who was a native of Harrogate, was President of the North of England Gas Managers' Association in 1907-8, and during his occupancy of the chair the members visited Harrogate and inspected the gas-works. He is survived by a widow and two sons, one of whom is Engineer and Manager of the Slough Gas and Coke Company.

CORRESPONDENCE

Storage of Coal

SIR,—In his letter on this subject, " Stock Coal " raises problems which were familiar when the present writer entered the Industry way back in the last century. That they still remain is fairly conclusive evidence that each particular case must be settled on its own individual merits. " Stock Coal " tells us he has 9000 tons of coal in stock, but does not say what ratio this bears to his total yearly coal usage—an element not to be overlooked.

There are two ways of viewing cost incurred in replacing coal put into stores (*i.e.*, taking out " old " and putting in " new ")—the actual cost of handling *plus* depreciation, (1) per ton so replaced, and (2) per ton of coal carbonized in each year. Storing coal is an insurance against interference with supplies by coal strikes, &c., and cost is governed by effective insurance. The insurance must not fail at the critical moment, or the whole object of storing has to the extent of a failure missed its purpose. " Stock Coal " says he has stored chiefly nuts, and he has not disturbed the coal put in following the last coal strike, a matter of, say, six years. Obviously, if, as he says, the coal gives such poor results that even at 5s. *plus* cost of handling it is dear coal to use, it is also a very poor insurance against the very things it was set by for, and he has no alternative, whatever the cost, to replacing with fresh coal at least a substantial percentage year by year, if, a strike or railway interference ensuing, the supply of freshly-mined coal will be cut off.

It is common experience for coal which has been stored for a few years to peter out far below expectation, if that is based upon results with fresh coal. For that reason, those who store coal prudently pay regard to these considerations: (*a*) If capacity is limited they set by the best possible coal obtainable which will give the minimum of depreciation on storage, (*b*) if there is unlimited capacity they may substitute for " best possible " a wider choice, but so increasing the quantity of the class of coal adopted for the purpose that it will prove good insurance in the day of " travail." Observing these fundamentals, it may then be said to be a matter of local determination whether they are further reinforced in security by replacement of the whole or part of the stock at frequent intervals (one, two, or three, years) with fresh coal as good as that originally set by.

" Stock Coal " says: " Many engineers no doubt allow their coal to remain in stock until it is almost useless from a gas-making point of view, unless the works are large enough to warrant suitable handling plant." If that is true, it follows that those same engineers are substituting " risk " for " insurance; " but is it really true? The major depreciation in coal put into store occurs within the first year of its being put down, and thereafter, if it is of a satisfactory storable quality, is infinitesimal. That is the writer's experience based on forty years' observation, as concerning coal put under cover. " Stock Coal " is apparently limited in choice of coal to be stored by the consideration of what it will do in his verticals when he turns to using it, and as nuts work most easily in verticals, he has chiefly used that grade for storing. It is understand-

able that the depreciation under storage of such coal will be heavier than if big lumps of a robust coal were stored. Why cannot he " clear out " the nuts, and resort to storage of bigger coal, carefully selected? He must be equipped with breakers, and when the time came for using the coal he would first pass it through the breakers.

Depreciation of coal in store depends upon many factors, but, other things being equal, size is the chief in determining whether depreciation will be " heavy " or " light." The greater the surface exposed to oxidation the greater will be the loss of " volatiles."

Your correspondent resorts to figures for illustrating his practice in financial depreciation of coal put into store. It would be interesting if he supplemented these by telling us what it really costs to take out and put in his 9000 tons of coal, and what is the incidence of this on his total coal carbonized in a full year. One question he does not raise, though it is matter of general concern—viz., " How many weeks' storage of coal should be set by?" Time was when six weeks' needs at the period of heavy output of gas was regarded as adequate, but that has been radically revised consequent on a series of strikes. It is not uncommon to have a reserve which will carry for three months or over; even that was insufficient in 1926. The bigger the stock carried the greater is the expense incurred in interest charges, apart from whatever losses ensue on the quality falling when used below that of similar freshly-wrought coal.

The best insurance would be that our mining industry abandon for aye the martial propensity of past years, and pay greater regard to its customers' interests, one of which is to be sure of getting coal supplies without either the clouds of stoppages threatening, or the darker clouds of their materialization. It costs a lot of money to provide against these contingencies; and if we could have some guarantee that the mining industry would in future comport its differences as peacefully as, say, the Gas Industry has done, it would be a useful contribution to the restoration of industrial prosperity for which we yearn, but which is as yet invisible.

Yours, &c.,
" OBSERVER."

Aug. 13, 1932.

SIR,—As the writer of the article in question, I would say that in my opinion the first thing that " Stock Coal " should do is to compare the gas-making quality of his coal which has been stored for three years with that of the coal he is now using. If he has no large-scale testing plant, there are good laboratory methods which, in the hands of experienced operators, will give a reliable comparison. The description of his method of stocking suggests that access of air may be largely avoided, and it may be that but little deterioration has occurred.

There must come a point in all methods of stacking, except under water, when coal has deteriorated so greatly that the quantity stored in terms of its gas-making potentiality is below the safe limit. How long elapses before that point is reached depends on:

(1) The quality of the coal.
(2) The method of storing.

Further guidance may be obtained by a cost balance. In the following the cost of handling is a figure taken quite at random.

(*a*) Coal not put into storage—

Cost of coal not put into storage . .	20s. per ton
	20s. per ton

(*b*) When the stored coal is changed frequently, we may have—

Cost of coal	20s. per ton
Cost of handling.	10s. ,,
Deterioration	2s. ,,
	32s. per ton

(*c*) When the coal is handled at long intervals, we may have—

Cost of coal	20s. per ton
Cost of handling.	10s. ,,
Deterioration.	10s. ,,
	40s. per ton

Clearly the less the cost of the deterioration *plus* handling *on the whole of the coal carbonized in the works*, the more economical will be the process. Infrequent handling will give the best results financially. In order to save frequent handling, therefore, it may be advantageous to obtain coal for stocking from the best Durham pits or from some similar source of resistant coals, so that:

(*a*) Deterioration is reduced.
(*b*) Because deterioration is reduced, the quantity of coal that has to be doubly handled, and is in consequence very costly, is reduced.

Deterioration, however, will not only affect the gas yield, but will also result in the production of much breeze and weak coke causing trouble in the producers, unless scientific methods of preparing coal for carbonization are used—methods not hitherto introduced into general gas practice.

The problem cannot, therefore, be regarded as one of economics only. Stocked coal must never be allowed to deteriorate beyond a certain point if trouble is to be avoided during strikes, &c.; the problem of when that point is reached is one which each engineer must decide for himself. It is not without significance that deterioration is most rapid in the earlier period of stocking; in the ideal, the stock coal should be changed often; in practice, a fair amount of deterioration must be allowed. If properly selected the coal can then be changed rarely. Much depends on proper selection; unless these factors are known with some degree of accuracy, it is impossible to say how often stored coal must be changed.

Yours, &c.,
G. E. FOXWELL.

12, *Agden Road*,
Sharrow, Sheffield,
Aug. 11, 1932.

Holding-Down Bolts for Disc-Type Gasholders

SIR,—I notice that Mr. Gadd asserts that " we are not discussing spirally-guided gasholders." These remarks are misleading to your readers. Mr. Gadd must recognize that we are discussing the formula that he deduced for the pressure on roller axles of spirally-guided gasholders, which appeared in the " JOURNAL " for Oct. 3, 1923. This formula was subsequently shown to be erroneous in an article contributed to the " JOURNAL " for March 12, 1924. Now, as Mr. Gadd again makes use of the same incorrect formula and applies it to a problem concerning holding-down bolts of disc-type gasholders, it is obvious that in order to rectify the errors made in his latest article it becomes necessary to eradicate the defects in his original contribution.

The fact that Mr. Gadd claims to be the first individual in the world to whom the original invention was divulged may be considered a distinction, and no doubt Mr. Gadd has followed the developments of the spiral-guided gasholder since 1887, but neither of these claims can excuse mistakes or place Mr. Gadd's mathematical deductions beyond question.

I am pleased to note that Mr. Gadd is able to agree equation (1) in my last letter of criticism, as this makes it a simple matter to show where he has gone astray.

In Mr. Gadd's original article (" JOURNAL," Oct. 3, 1923), fig. 5 indicates that he has substituted the values F for 2*a*, F_1 for 4*b*, F_2 for 4*c*, &c., so that we may reduce equation (1) thus:

$$2aR + 4bm + 4cn + 4do + 4ep = D\left(H^2 + \frac{D^2}{3}\right) \quad . \; . \; (1)$$

$$= FR + F_1m + F_2n + F_3o + F_4p = D\left(H^2 + \frac{D^2}{3}\right) \quad . \; . \; (2a)$$

Now F, F_1, F_2, &c., represent the vertical displacements due to stress at the points to which they refer in fig. 5. Mr. Gadd states " the relative values of such reactions depend upon the respective distances from the centre *z* (the fulcrum or central axes of the system) after the manner of induced stresses in a cantilever subject to bending moments," or

$$F_1 = \frac{Fm}{R}$$

Now F_1 is a displacement only, but Mr. Gadd states, " and the moment $F_1 \times m$." Such an expression is meaningless, for there is no such thing as a displacement moment. A resisting moment is (force × distance), but F_1 does not represent a force; F_1 represents a displacement from which the resistance force may be calculated. The resisting force is obviously dependent upon the number of carriages operating. Mr. Gadd, however, takes not the slightest notice of the number of carriages in deducing equation (2*a*). There are four carriages at distance *m*, but only two at distance R from the fulcrum. Referring to fig. 4, it seems Mr. Gadd maintains that the two outermost carriages at distance R from the fulcrum offer a greater resistance to overturning of the holder than four carriages which are at distance *m*. On a large holder the distance *m* is nearly equal to R, therefore the vertical displacements are nearly the same. I fear Mr. Gadd will find it difficult to prove that two carriages offer nearly the same resistance as four in this case.

I cannot understand Mr. Gadd's remark, " it is not true that the imaginary triangle, two of which sides represent *b* and *m*, is a similar triangle to the one parallel to it."

If the sides are parallel it must be a similar triangle. I would also add that the resistances *do* lie in the same plane. The penultimate paragraph of Mr. Gadd's letter appears to contradict his earlier statement, as he mentions that in getting his own formula he only needed to use "resultant resistances situated in the same plane." I certainly cannot agree with Mr. Gadd's astonishing conclusion, that it does not matter how the components of the resultant resistances are distributed about a horizontal plane in the case concerned, even if the correct number of terms to suit are accounted for. I therefore suggest that my modification of Mr. Gadd's formula should be adopted, as it provides for a systematic distribution of the resistances about the horizontal plane, and conforms to the laws governing inertia, on which principle the momental resistances should obviously be based.

Yours, &c.,
S. M. MILBOURNE.

31, *Warren Road*,
Cricklewood, N.W. 2,
Aug. 13, 1932.

Motor Fuel from Coal

SIR,—I welcome Viscount Selby's appeal, in the "JOURNAL" for Aug. 3, to use more coal.

To supply all our motor fuel and oil from home resources, as he suggests, should increase our coal production by between 25 and 30 million tons a year, which represents a very considerable proportion of our total present output per annum; while to build the necessary plant would create between 150 and 200 million pounds' worth of reproductive work.

The present abnormally low price of petroleum products hinders such a development. The difficulties are, however, economic rather than technical. The success achieved with home-produced benzole fuel is evidence that we could become very largely self-supporting.

Yours, &c.,
M. GRATTAN-DOYLE.

House of Commons,
Aug. 9, 1932.

THE NEWS OF THE WEEK

The Supposed Causes of Fire in Glasgow, as shown by the Annual Report of the Glasgow Fire Master, for the twelve months ended May 31, 1932, were: Electricity, 46; gas, 8.

Altrincham Company's Dividend.—Interim dividends of 4⅝ p.ct. on the original shares and 3½ p.ct. on the new shares of the Altrincham Gas Company, less income-tax, were paid on Aug. 11 last.

South Shields Gas Company Dividends.—Dividends for the half-year ended June 30, 1932, as under, have been paid by the South Shields Gas Company: On the Consolidated stock 4¼ p.ct., less income tax; on new stock 4¼ p.ct., less income tax; and on ordinary stock 2⅞ p.ct., less income tax.

Cheaper Gas for Altrincham.—The Directors of the Altrincham Gas Company announce that the price of gas will be reduced by ¼d. per therm (2¼d. per 1000 c.ft.), as from the June quarter's meter readings. The price will then be 8d. per therm (3s. per 1000 c.ft.), less the usual discount for accounts paid within the prescribed period.

The Japanese Imperial Gas Association recently held their Twentieth Annual Meeting at Nara, when among the papers read was one on "Research Results on Ignition Temperatures and the Combustion of Coke and Charcoal" by Prof. Oshima, of the Tokio Imperial University, and one on "Present Developments in Low-Temperature Carbonization" by Prof. Kosaka, of the Osaka Institute of Technology.

The German Chemical Plant Exhibition, arranged by the Dechema, Deutsche Gesellschaft für Chemisches Apparatewesen (Head Office: Seelze, Hannover), will take place at Cologne in 1933 (probably from June 2 to 11) at the same time as the Conferences of the Verein Deutscher Chemiker, the Deutsche Kautschukgesellschaft, the Deutsche Brennkrafttechnische Gesellschaft, and the Dechema. Other scientific and technical societies will also hold their annual meeting at Cologne during the same period.

There was a Short Break in the production of gas at the Higginshaw Works of the Oldham Gas Department in order to allow the dismantling of the old gas coolers and progress with other work entailed in the new scheme. This was carried out satisfactorily, and gas is now again being made at the works. In the fortnight ended July 19, sales of gas totalled 52,069,000 c.ft., or 2,328,000 more than the delivery in the corresponding fortnight last year. The amount of coal used was 2997 tons, against 3037 tons. It is creditable to all concerned that the production of gas during the alterations was so well maintained.

Further Price Reductions in Scotland.—The Perth Town Council have reduced the price of gas from 3s. 7d. per 1000 c.ft. to 3s. 6d., while the price of gas has been reduced by the Rothesay Town Council from 4s. 2d. per 1000 c.ft. to 3s. 9d.

Gas Production in Spain.—A return lately issued shows that there are now 51 gas undertakings in Spain, and that the output of gas in the country has increased from 4,089,251,000 c.ft. in 1928 to 5,195,023,000 c.ft. during last year, the latter total contrasting with 4,658,631,000 c.ft. in 1930. The coal consumption by Spanish gas-works rose from 334,074 tons in 1928 to 437,497 tons last year, and the output of coke from 204,504 tons to 261,630 tons.

The Lighting of Liverpool.—According to the annual report of the Liverpool City Lighting Engineer, there are 661 miles of streets lit with gas, 216 with electricity, and half-a-mile with oil. Of the 17,469 gas lamps, 1067 are four-light, 5847 two-light, and 10,170 are one-light. The price of gas for street lighting in Liverpool is 7·4d. per therm, less 20 p.ct. The consumption has been 944,753 therms, as against 943,658 therms in the previous year. Gas meters tested numbered 35,777; and 1039, or 2·9 p.ct., were rejected. Of those submitted for testing 25,473 were of the prepayment type. The Liverpool Gas Company sent 15,836 meters for testing, at a cost of £891; meter manufacturers, 16,634, at £887; local authorities, 2722. The reasons for the rejection of meters were: Inaccurate registration (fast 289, slow 172), 461; passing of gas without registration, 107; internal leakage, 84; external leakage, 105; excessive absorption of pressure, 136; will not pass gas, 98; defective markings, 16.

Gas Production in Scandinavia.—The seventeenth annual meeting of the Swedish Gas Association was lately held in Halsingbork, when the report which was presented showed that the output of the thirty-seven gas undertakings in Sweden amounted last year to roundly 6,055,997,000 c.ft. as compared with 5,653,824,000 c.ft. in 1930, an advance of 7·11 p.ct.—and this notwithstanding the ever-increasing output of hydro-electric power in the country. Among the papers read at the meeting was one by Mr. T. Neumann, of the Norwegian Union of Gas Engineers, in which he dealt with the question of gas and electricity in Norway. He stated that there are fourteen gas-works in Norway the output from which has shown a decrease of about 10 p.ct. during the past ten years. The decline was due to the very low rates at which hydro-electricity was supplied in the country, which had practically eliminated the use of gas both for lighting and power purposes. Another reason for the decline was that most of the gas-works were over sixty years old, although, of the fourteen, six had been reconstructed during recent years.

Fatality Caused by Electrician's Interference with Gas Fitting.

The death on July 6 of Mr. Frederick Harcourt Kitchin, formerly Editor of the "Board of Trade Journal," was stated at the inquest at Gosport, Hants., recently, to be due to an accidental escape of gas in his bedroom.

Frederick H. Jackman, Inspector of the Gosport District Gas Company, said that he found the lighting point in Mr. Kitchin's bedroom, from which the fitting had been removed, was plugged with a brown composition instead of with the regulation screw plug.

Edward Gould, the engineer who installed the electric light, said that he plugged all the gas points after removing the fittings with the exception of that in Mr. Kitchin's bedroom, where the reducing nipple broke. This prevented the use of the regulation plug, so he filled the hole with bitumen rammed in hot.

The Coroner: How do you suppose the escape occurred?

Gould: I am not prepared to say. There was not enough pressure of gas to blow the bitumen out.

The Foreman: Would it not have been safer to have drilled the point and re-tapped it?

Gould: Perhaps it would, but I had not a drill big enough.

Samuel John Davis, the Gas Company's Superintendent, said that owing to contraction the bitumen had broken loose.

The jury, in returning a verdict of "Death from misadventure," expressed the opinion that Gould should be censured for the lax manner in which he had carried out the work.

British Industries Fair, 1933.

At the first meeting of the Gas Industries Section 1933 Committee, Dr. E. W. Smith, C.B.E., was asked to act as Chairman for another year.

Mr. W. L. S. Spinks (Assistant Fittings Superintendent, Birmingham Gas Department) was elected Hon. Secretary in place of Mr. R. J. Rogers.

The Composition of the 1933 Committee is as follows:

Chairman—E. W. Smith, C.B.E., D.Sc.

Vice-Chairman—A. W. Smith.

Representing the Society of British Gas Industries.

H. E. Bennet, Douglas Street Works, Westminster, S.W. 1.
C. S. Bennett, Gibbons Bros., Ltd., Dibdale Works, Dudley.
T. Alborn Clapham, Clapham Bros., Ltd., Keighley, Yorks.
Alderman G. Clark, J.P., Bryan Donkin Company, Ltd., Chesterfield.
Alexander Comley, 174, Corporation Street, Birmingham.
E. J. Fox, Stanton Ironworks Company, Ltd., near Nottingham.
W. J. Gardner, Meltham Silica Firebrick Company, Ltd., Meltham, near Huddersfield.
W. H. Handley, Rose Mount Ironworks, Elland, Yorks.
Leonard Hartley, Clayton, Son, & Co., Ltd., Moor End Works, Hunslet, Leeds.
H. A. Hobson, W. Parkinson & Co., Bell Barn Road.
John Orme, National Gas Engine Company, Ltd., Ashton-under-Lyne.
T. F. C. Potterton, T. Potterton, Ltd., Cavendish Works, Ravenswood Road, Balham, London, S.W. 12.
R. J. Rogers, Parkinson Stove Company, Ltd., Stechford.
E. W. Smith, C.B.E., D.Sc., Woodall-Duckham Companies, Allington House, Victoria Street, London, S.W. 1.
H. M. Thornton, J.P., 164-172, Queen Victoria Street, London, E.C. 4.
Douglas W. Turner, Wellington Tube Works, Ltd., Great Bridge, Tipton, Staffs.
B. B. Waller, Geo. Waller & Son, Ltd., Phœnix Ironworks, Stroud, Glos.
Frank West, Derbyshire Silica Firebrick Company, Ltd., Friden, Hartington.
Albert J. West, Gas Meter Company, Ltd., 238, Kingsland Road, London, E. 2.
Thos. O. Wilton, Chemical Engineering & Wilton's Patent Furnace Company, Ltd., 76, Victoria Street, S.W. 1.
A. L. Griffith, Secretary, Society of British Gas Industries, 56, Victoria Street, Westminster, S.W. 1.

Representing the National Gas Council.

W. J. Sandeman, General Manager, Croydon Gas Company.
L. E. Clift, Redditch Gas Company.

Representing the Institution of Gas Engineers.

Ralph E. Gibson, Engineer, Liverpool Gas Company.
H. C. Smith, Chief Engineer, Tottenham and District Gas Company.
J. R. W. Alexander, Secretary, Institution of Gas Engineers.

THE NEWS—continued.

Representing the British Commercial Gas Association.

Sir Francis Goodenough, C.B.E., Executive Chairman, British Commercial Gas Association.
H. Pooley, Engineer and Manager, Gas Department, Leicester.
J. C. Walker, British Commercial Gas Association.

Representing the City of Birmingham Gas Department.

A. W. Smith, General Manager and Secretary.
G. M. Lewis, Controller of Gas Sales.

Representing the Birmingham Chamber of Commerce.

Peter F. Bennett, President, Birmingham Chamber of Commerce.
C. E. Greener, Chairman, Fair Management Committee, British Industries Fair.
H. Eyles, Secretary, Chamber of Commerce, Birmingham.
C. Elliott, General Manager, British Industries Fair.

Hon. Secretary.

W. L. S. Spinks, Gas Department, Birmingham.

In his progress report the Hon. Secretary reported that applications had been received sufficient to occupy more than the whole of the space allotted to the Gas Industries Section in 1932. An additional area of 1400 sq. ft., adjoining the present Section, had been obtained from the Fair Authorities.

Seasonable Use for Gas.

Birmingham Gas Department's Attractive Fruit Bottling Display.

A most pleasing and colourful window display was one which the Birmingham Corporation Gas Department has had in its Paradise Street Showrooms recently. This was a "Fruit Bottling by Gas" display, and was carried out in conjunction with Messrs. John Wright & Co.

The display consisted of a large centre-piece in white and gold with a group of fruits in bright colours mounted on black velvet. On each side of the "Eureka" "New World" gas cooker were stands in a modern style with shelves on which bottles of fruits were stood. Two attractive cut-out panels in black, white, and gold, together with a selection of various fruits and fruit-bottling equipment and literature, completed a display which attracted a good deal of interest.

Newbury Undertaking's Lighting Contracts.

The Newbury Corporation Gas Department have recently secured a five-year public lighting contract for 34 lamps for the Thatcham Parish Council, in competition with electricity. The Newbury Corporation are purchasing the Thatcham Gas Company, Ltd., and as gas will be supplied from Newbury as from Oct. 1, the Department requested the opportunity to quote for the public lighting, which has been held for some years by the Wessex Electric Supply Company. As a result, their tender has been accepted.

They have also secured a five-year contract from the Donnington and Speen Parish Councils for the lighting and maintenance of 21 lamps. These will bring the number

THE NEWS—continued.

of lamps lighted and maintained by the Newbury Corporation Gas Undertaking to about 420.

These figures should prove of interest and use to the Gas Industry by showing that the smaller gas undertakings can compete against electrical competition if they have the will to do so.

Recording Achievements of British Industry.

A world-wide campaign to give publicity to the achievements of British industry has begun by the publication of the first number of "Industrial Britain." This is a new bulletin which is to be published monthly by the Travel and Industrial Development Association of Great Britain and Ireland.

The bulletin, which is a journal of information for editors and industrialists in all parts of the world, is written in English, French, and German. Its contents consist of news relating to the industrial development of the country as a whole and of those sections in particular which have created, or are in process of creating, industrial development councils or associations.

Chesterfield Traders Visit Gas-Works.

Much interest was evinced at the Chesterfield Municipal Gas-Works on the occasion of a recent visit by members of the local Chamber of Trade, including the Mayor and Mayoress Elect (Councillor E. W. and Mrs. Swale).

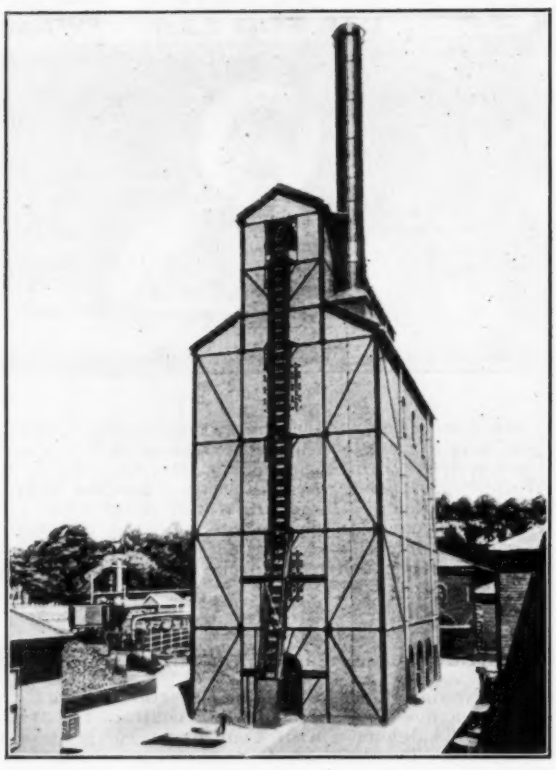
The visitors were conducted round the works by Ald. G. Clark (Chairman of the Gas Committee) and the Gas Engineer and Manager (Mr. H. Davies).

Ald. Clark, in welcoming the visitors, mentioned that Chesterfield was one of the first towns in the country to have gas lighting. They commenced to supply gas in 1826, and according to the first ledger of the Company the price was then 13s. 6d. per 1000 c.ft. Since the war the number of consumers of gas at Chesterfield had increased by 32 p.ct., and the total output had risen from 159,500 million c.ft. in 1902 to 331,610 millions in 1931. "Some people think electricity is driving gas away, but this is not so," added Ald. Clark. "Electricity is causing competition and has livened up the Gas Industry. Gas is not a dying industry, but a real live one."

New Vertical Retorts at Launceston, Tasmania

An Installation by the Woodall-Duckham Company

On March 18 an installation of Woodall-Duckham continuous vertical retorts, having a gas-making capacity of 350,000 c.ft. per day, was inaugurated at the works of the Launceston Gas Company, Tasmania, of which Mr. H. L. Stevens is Engineer. The new retort bench is erected in a steel frame retort house, and is complete with coal and



coke handling plant. The contractors for the scheme were Messrs. Woodall-Duckham (Australasia) Pty., Ltd.

From the new vertical house the gas is conveyed through a length of 12-in. steel main and connected to 12-in. atmospheric condensers. The gas is then conveyed through 12-in. pipes underground to the exhausters, which consist of one Bryan-Donkin of 25,000 c.ft. per hour capacity, direct steam driven, and one Bryan-Donkin 25,000 c.ft. per hour capacity, belt driven from a 5½-H.P. vertical steam engine. The gas then passes through a Walker patent washer scrubber, and finally through a Livesey washer, each having a capacity of 250,000 c.ft. per day.

The installation consists of one bench containing four retorts heated by means of two producers placed at retort house floor level at one end of the bench. Provision is made for the future extension of the plant by the addition of two more retorts.

East retort is about 25 ft. high, and of rectangular tapered shape, so designed as to allow continuous regular movement of the charge through the retort.

The Retort Bench.

The design of the setting is in accordance with the latest practice of the Woodall-Duckham system, special features being as follows:

(1) Each retort is absolutely separate from the next, and ventilated division walls are provided between adjacent retorts and between the producer gas uptake and the first retort, so that any individual retort may be heated up, cooled down, scurfed, or repairs carried out without affecting the others. Each retort is provided with its own producer gas, secondary air, and waste gas dampers, and thus forms a separate heating unit. By thus arranging that each retort is a separate unit, maximum flexibility in output is obtained.

(2) The retort faces and combustion chambers are constructed of the highest quality silica material for the full depth of the combustion chambers. This ensures low maintenance costs, coupled with high output per retort.

(3) In order to provide means of varying the relation between the temperatures at the top and bottom of the combustion chambers, arrangements are made for the introduction of additional secondary air at a second point in the combustion chamber. It is thus possible to vary the zoning of the heats according to the type of coal carbonized and the calorific value of the gas to be made.

(4) Both the side walls and the top of the bench are heavily insulated, with the double object of improving the working conditions and saving fuel.

(5) The vertical combustion flue construction, apart from providing the advantages of even heating, easy inspection, and easy control, gives maximum strength in the structure of the retort, and thus reduces maintenance costs to the minimum.

Producers.

For heating the retorts, two step-grate producers are built at one end of the bench at retort house floor level. Each producer is large enough to supply the gas for heating four retorts, and one producer may be shut down without interfering in any way with the working of the other, provision being made so that the gas from either

producer may be taken to the heating flues of any of the retorts.

Maximum flexibility is obtained as regards both producer gas output and quality of fuel used by provision of doors in front of the producers and by arrangements whereby primary air may be injected by steam into the producers to overcome the resistance of the fuel bed.

Waste-Heat Boiler.

For utilizing the major portion of the heat contained in the waste gases after they leave the setting, and before they are discharged to atmosphere, a waste-heat boiler has been installed. The boiler is of the vertical fire-tube type, working under natural draught, and raising steam at a pressure of 100 lbs. per sq. in. The boiler is fitted with all the necessary steam and water mountings and fittings, including high and low water alarm and thermo automatic feed water regulator.

So that, if desired, the boiler may give its maximum output of steam irrespective of the number of retorts in operation, provision is made so that a supplementary supply of producer gas can be mixed with the waste gases from the retort bench before these gases are passed to the boiler.

There are two feed water pumps of the duplex type, each of which is capable alone of supplying the boiler's requirements.

Power.

The coal elevator and coal breaker are electrically driven. A steam engine drive provides the power required for the coke extractor and the liquor circulating pumps. A gas engine is installed as a stand-by to the steam engine for this service.

The whole of the steam is provided by the waste-heat boiler, and sufficient surplus is available to supply the requirements of the retorts, the producers, and the rest of the works engines.

"Domestic Utilization of Gas"*

Reviewed by Philip G. G. Moon, M.Inst.C.E., F.C.S., Engineer and General Manager, Bournemouth Gas and Water Company.

This is a valuable and much needed text-book which deals in a simple and scientific manner with the principles involved in the utilization of gas for heating, lighting, and refrigeration.

Messrs. Smith and LeFevre are obviously masters of their subject, and the composition of gas and its heating value, the flow of gas in pipes, its measurement and pressure, combustion in atmospheric and bunsen burners, ventilation, and the efficiency of gas appliances generally, together with many other matters connected with the utilization of gas, are dealt with lucidly and clearly. The book is full of the accurate information which it is essential that all gas officials who are in contact with the competition of other heating agents should have at their finger tips, and which in the past it has been very difficult to find in an up-to-date and easily accessible form.

Messrs. Smith and LeFevre are to be congratulated upon the manner in which they have explained the many difficult points dealt with in their book; and all gas salesmen, inspectors, and fitters who master its contents should be thoroughly well equipped to deal with the many problems which arise in the course of their daily work in connection with the utilization of gaseous fuel. They will also be capable of combating effectively, by means of actual facts, the mis-statements with regard to gas which are so apt to be made by too enthusiastic supporters of competitive fuels, and which are so difficult to deal with in the absence of correct data.

The advantages of gas as a heating and lighting agent are many and definite, but every day it becomes increasingly necessary for all engaged on the distribution side of the Industry to have a full and accurate knowledge of its properties and utilization such as is contained in this book.

There is, unfortunately, at the present time a great lack of reliable and up-to-date text-books relating to the Gas Industry and available at a moderate price, and the authors of this manual are to be congratulated upon producing a work which should prove of the greatest possible value to the Industry.

I wish the publishers every success in their enterprise, and hope that this text-book is but the forerunner of other similar publications dealing with other phases of Gas Manufacture and Distribution. I am sure that the greater the number of copies purchased, read, and assimilated, the better it will be for the Gas Industry generally.

* "Domestic Utilization of Gas—The Principles Involved," by Norman S. Smith, B.Sc., Assoc.M.Inst.Gas E., and R. N. LeFevre, Assoc.M.Inst.Gas E. Published by Walter King, Ltd., 11, Bolt Court, Fleet Street, E.C. 4; price 5s. 6d. post free.

Section of Ellington Park, Ramsgate, specially floodlighted by the Ramsgate Corporation Gas Department during the recent local Sports Week.

Advances in the Industrial Uses of Gas*

Abstract of a Paper by O. Wolff on coal, oil, gas, and electricity in competition

The author discusses, *inter alia*, the competition which exists between coal, oil, gas, and electricity for the industrial heating load, and admits that, on the mere basis of fuel costs, coal is generally the cheapest form of heat energy. However, a large number of modern processes—*e.g.*, the heat treatment of metals, require such a rigid working conditions that a source of heat under perfect control is essential, and, moreover, in many instances fuel costs are of slight importance in comparison with the total manufacturing costs of an article. Where very high temperatures are required, the electric arc offers the simplest solution.

The object of the author is to demonstrate that in a large number of processes in which electrical heating has been successfully applied, the same results can be obtained as easily with gas at but one-half to one-third the cost.

Electric heating and annealing furnaces have attained an efficiency of 60-80 p.ct., whereas, formerly, gas seldom exceeded an efficiency of 30-50 p.ct., due to 30-50 p.ct. of the heat being lost in the waste gas. Nevertheless, 1000 c.ft. of 450 B.Th.U. gas gives at least as much useful heat as do 50 electrical units; hence gas is more economical so long as the price per 1000 c.ft. does not exceed 50 times the cost of a unit. Actually, electrical efficiencies have now reached the attainable limit, whereas the technique of gas oven combustion is still in its infancy. Heat-resisting alloys have rendered possible recuperation of heat, and thereby waste gas losses can, in many cases, be reduced to a low figure. Thus, the efficiency of continuous furnaces in which the goods move in counter or direct current to the heating gas has been raised from 30-40 p.ct. to 65 p.ct.—a figure approaching that of electrical furnaces. As regards radiation losses, there is no reason why gas furnaces should not be equally as well insulated as electrical furnaces. Heat transfer to the goods is better in the case of gas furnaces, since radiation is assisted by convection, whereas in electric furnaces heat transfer is by radiation only, unless resort is had to artificial circulation of gases.

It is a fallacy to imagine that gas cannot be used for the annealing of wires, &c., owing to the necessity for the exclusion of air. During the actual annealing, no air can enter owing to the internal pressure developed by the expanding gases, and it is merely necessary to employ a pot of such a nature that ingress of air during cooling is prevented. The Prüfert process works on the principle that the pot, after the annealing operation, is placed under a sealing bell, and the air under the latter is consumed by throwing an oil-steeped rope into the red-hot pot, the bell being then lowered into a water seal. Under comparable conditions as to working temperature and pot dimensions, 170-220 KW.-H., or 2100-2800 c.ft. of gas, is required per ton of annealed blanks. A continuous furnace (Harter system) for heating steel and non-ferrous blanks to a temperature of 750° C., with a view to providing articles with a minimum amount of scale and suitable for further pressing or drawing without pickling, works with a gas consumption of approximately 10 therms per ton of metal.

Revolving ovens may be used for brazing the bodies of water-heaters, and offer advantages over the old types of moving chain ovens. Such an oven may handle 132 bodies per hour with a working temperature of 820°-860° C., and the gas and labour costs are both reduced by 50 p.ct.

In the field of small iron goods where coal was formerly employed with an efficiency generally less than 10 p.ct. in forging and heating and in screw and rivet ovens, gas is applicable with an efficiency of at least 25-30 p.ct., or even of 40 p.ct. in special ovens with preheated air, on which tests are now being made.

Gas has been successfully applied for the annealing of plates of aluminium and its alloys under stringent conditions, requiring, at the end of the operation, a temperature difference of less than 10° C. over a furnace space 13 ft. long, 5 ft. wide, and 2½ ft. high, even though the different alloys require temperatures ranging from 250°-550° C. It has also been adopted for the melting of brass, gun-metal, bronze, and German silver. In the case of such alloys, the time required for melting 175-lb. charges has been reduced from 70 minutes with coke as fuel to 30-35 minutes with gaseous fuel, and the heating-up time has been reduced by about 70 p.ct. The life of the crucibles is extended from 30 charges to 40-45 charges. The fuel consumptions per ton are 8000 c.ft. of gas at 2s. per 1000 c.ft., as compared with 7 cwt. of coke at 42s. per ton. Labour for eight melting ovens involves the part time of one smelter and one mate for gaseous fuel, as against two smelters on full time and one mate on part time in the case of coke firing, overall costs being 45s. and 66s. per ton of metal respectively.

An important use for gas in large towns is for melting furnaces for metals in printing shops, &c. Small melting pots of a capacity of ½ cwt., built into the type-setting machines and operating on gas, have long been used, but care has often not been taken in leading away the waste gas and in providing automatic temperature control and convenience in operation. Hence, electrical heating is nowadays mostly employed, even though the latest types of electrically heated machines consume 1 unit in comparison with 12 c.ft. of gas. More important are the larger melting pots for re-melting type metal and the plates of rotary presses. These often have a capacity of 1-5 tons, and must be very welcome, as they are constant consumers. This field, with a little effort, should not be lost by the Gas Industry.

In enamelling ovens, the efficiency with coal firing is generally 6-8 p.ct., but this can be increased, in the same ovens, to 15-16 p.ct. with gaseous firing. With electric heating, the maximum attainable efficiency is 25 p.ct. Conditions are better in the continuous ovens in general use in America, though these are too large for use in individual works in Germany. However, the waste gas from static gas-heated ovens can be used for drying purposes, and the efficiency can thereby be brought up to more than 50 p.ct. Gas heated ovens can only compete with coal if gas is sold cheaply, but this applies even more so to electricity.

In a gas-fired oven for the stoving of japanned ware, the waste gases which leave the drying chamber at a temperature of 220° C. are, with rejection of a portion, re-circulated into the oven by means of a fan and a main which contains burners to reheat these gases to 300° C. The consumption of current in a modern continuous electrical japanning stove is equivalent to approximately 47 KW.-H. per ton of japanned sheets, compared with 900-1250 c.ft. of gas, even in the case of an oven in which the air is indirectly heated by means of gas. In a three-chambered gas-heated stove supplied with air at 350° C., each chamber deals with 0·6 ton of japanned pipes in approximately 38 minutes, the drying temperature being 200° C. The average gas consumption is approximately 700 c.ft. per ton of pipes.

Continuous drying ovens have also, for some years, been employed in connection with the japanned blades of reaping machines. The circulating air is heated by means of gas in heat interchangers, the efficiency being 70-75 p.ct. Electricity cannot compete with this.

Another application which the Gas Industry should note is in connection with cutting and welding with an acetylene-coal gas mixture. Replacement with coal gas of part of the acetylene normally used leads to savings of 30-40 p.ct.: 1000 c.ft. of acetylene costing 28s. can be replaced by 630 c.ft. of acetylene *plus* 630 c.ft. of gas—*i.e.*, 630 c.ft. of gas displaces 370 c.ft. of acetylene.

Efficiencies of 100 p.ct. can be obtained in the concentration of liquid and in other chemical processes by means of the Hammond system of submerged combustion.

Comparison of oil, gas, and electricity indicates that, with fuel oil costing £4 per ton at works (*i.e.*, £5 10s. to £6 per ton at the burners), gas, to be competitive, must be sold at 1s. 3d.-1s. 5d. per 1000 c.ft., and electricity at 0·35d.-0·4d. per unit.

Gas at this price cannot compete in the case of processes in which a constant and large amount of purified producer gas is used throughout the 24 hours, though conditions are different if these reservations do not hold good.

In spite of the low prices charged in the Ruhr district to large consumers of electricity for industrial heating operations (0·35d. per unit), electrical heating has, so far, only been applied in a limited degree, and the total amount of electrical energy sold for all purposes, including lighting and domestic heating, has not yet reached two-thirds of the quantity of heat energy supplied in the form of industrial gas by the Ruhr network.

* O. Wolff, 73rd Congress of the German Institution of Gas and Water Engineers, "Das Gas- und Wasserfach," 1932, **75**, 617-623 (July 30).

. . Fifty Years' Gas . .

Progress in North Sydney

Jubilee Year of the North Shore Gas Company, Ltd.

HEAD OFFICE AND SHOWROOMS, 1932.

In the year 1875 Messrs. Charles Watt and James Walter Fell obtained the rights from Legislature to erect gas-works, and to supply gas within the municipalities of East St. Leonards, Victoria St. Leonards, and North Willoughby. These gentlemen commenced supplying gas in the year 1876.

In 1882 the North Shore Gas Company, Ltd., was formed, and purchased the rights under the North Shore Gas Act, 1875, from Charles Watt and the Trustees of James Walter Fell, and have continued to supply gas to the present time. The Municipalities mentioned were subsequently incorporated in the Municipalities of North Sydney, Mosman, Lane Cove, and Willoughby.

The Company has two works, one at Neutral Bay and the other at Oyster Cove. The works at Neutral Bay were started by Messrs. Watt & Fell, and the photograph taken in 1882 shows the size of the gas-works over fifty years ago when the Northern Suburbs of Sydney were very sparsely populated.

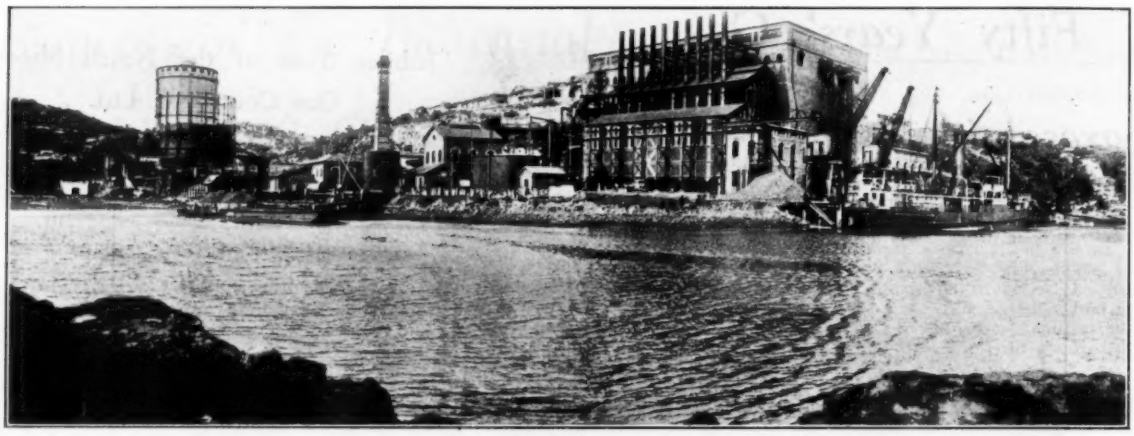
In 1884 Mr. T. O. Morland came from England as Engineer and Manager, and continued in that capacity for 35 years when he resigned, and was subsequently elected to a seat on the Board of Directors. For two years he acted as Consulting Engineer. He was a Director of the Company for twelve years, and was Chairman of the Board for nine years of that period. He resigned from the Board in April last. For nearly fifty years, therefore, he served the Company in various capacities, and the success it has attained has been in no small measure due to his ability, energy, and perseverance. From the very small beginning, as shown in the photograph, the works at Neutral Bay have been enlarged from time to time until the manufacturing capacity reached 2½ million c.ft. per day. As the consumption of gas kept increasing, and as it was not possible to erect further plant at Neutral Bay, the construction of a new works at Oyster Cove was started in 1912. Owing to the war, the completion of these works was delayed, as there was difficulty in obtaining the necessary plant from England, but at the end of 1917 gas-making was commenced in Glover-West vertical retorts. At the time of their opening, these works contained the most modern and up-to-date plant in the Southern Hemisphere, having a capacity of 2½ million c.ft. of gas a day.

Waterless Gasholder.

In recent years it was found necessary to erect an additional gasholder at Oyster Cove, and the waterless type of holder was ordered in 1929. This holder, of 2½ million c.ft. capacity, can be seen in the photograph, and is the largest of its kind in Australia. Since it was put in commission on July 1, 1930, there has been no hitch in its working, and it has given every satisfaction to the management.

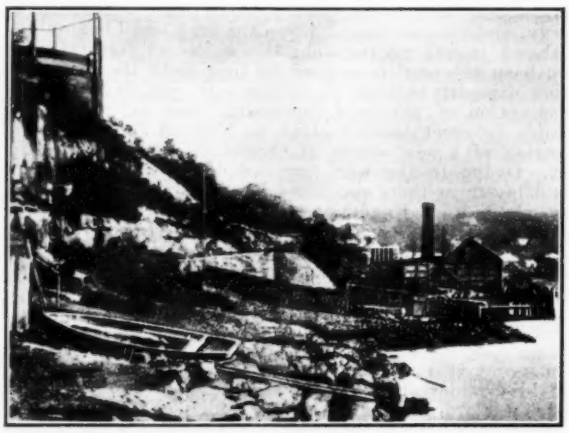
In 1925 the Government resumed, for harbour bridge purposes, the offices of the Company situated in Alfred Street, North Sydney, and the Company during that year

A MODEL OF THE SYDNEY HARBOUR BRIDGE AND NORTHERN APPROACH SHOWN AS A WINDOW DISPLAY BY THE NORTH SHORE GAS COMPANY, LTD., DURING BRIDGE WEEK CELEBRATIONS.



OYSTER COVE WORKS, 1932, SHOWING THE WATERLESS GASHOLDER ON LEFT.

erected very commodious offices at the corner of Miller and Blue Street, North Sydney, and these offices are a credit to the district. They include a very extensive showroom, where the most up-to-date cooking and water-heating appliances are exhibited and demonstrated, and also a large lecture hall where weekly demonstrations of economical cookery are given.

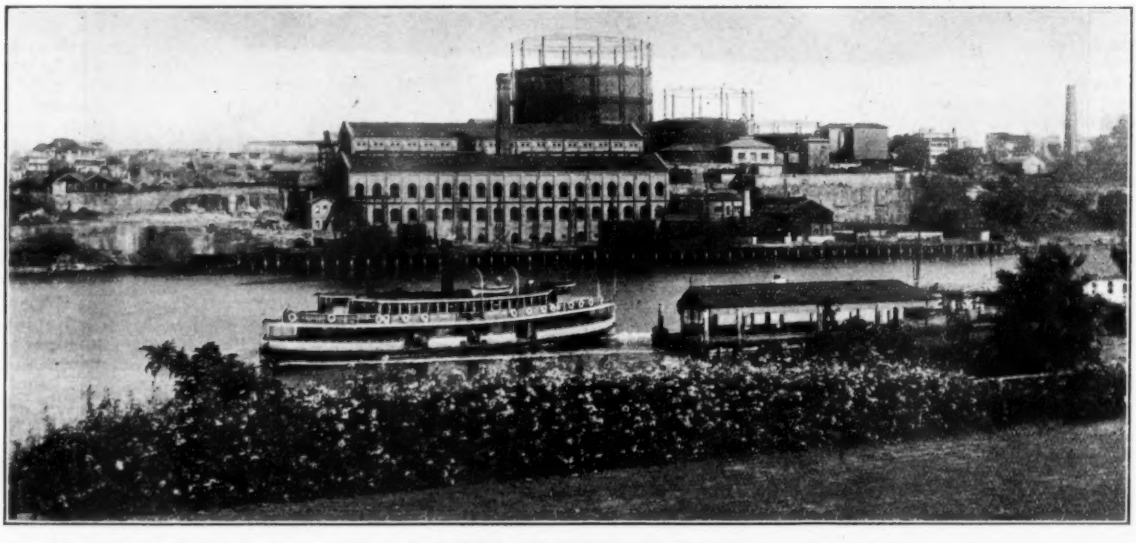


Neutral Bay Works, 1882.

A Gas-Fired Hospital Kitchen Installed by the North Shore Gas Company.

The output of gas for the year 1931 was 982,300,505 c.ft. It is interesting to note that the revenue of the Company for that year was £306,564, as compared with £7047 for the year ended Dec. 31, 1883. The authorized capital of the Company at the end of 1931 was one million pounds, of which the paid-up capital amounted to £740,675, and the loan capital for that year was £351,037. At the end of 1883 the authorized share capital was £100,000, of which the paid-up capital amounted to £49,300. The coal carbonized by the Company during the year 1931 was 66,201 tons, and the oil utilized was 114,837 gallons.

The Directors of the Company are: Mr. J. B. Thomson (Chairman), Mr. A. McVernon, Mr. J. Warrand Watt, Mr. J. A. Minnett, and Sir Thos. Henley, K.B.E. Mr. S. J. Janes is Secretary, and Mr. Edgar Foster, Engineer.

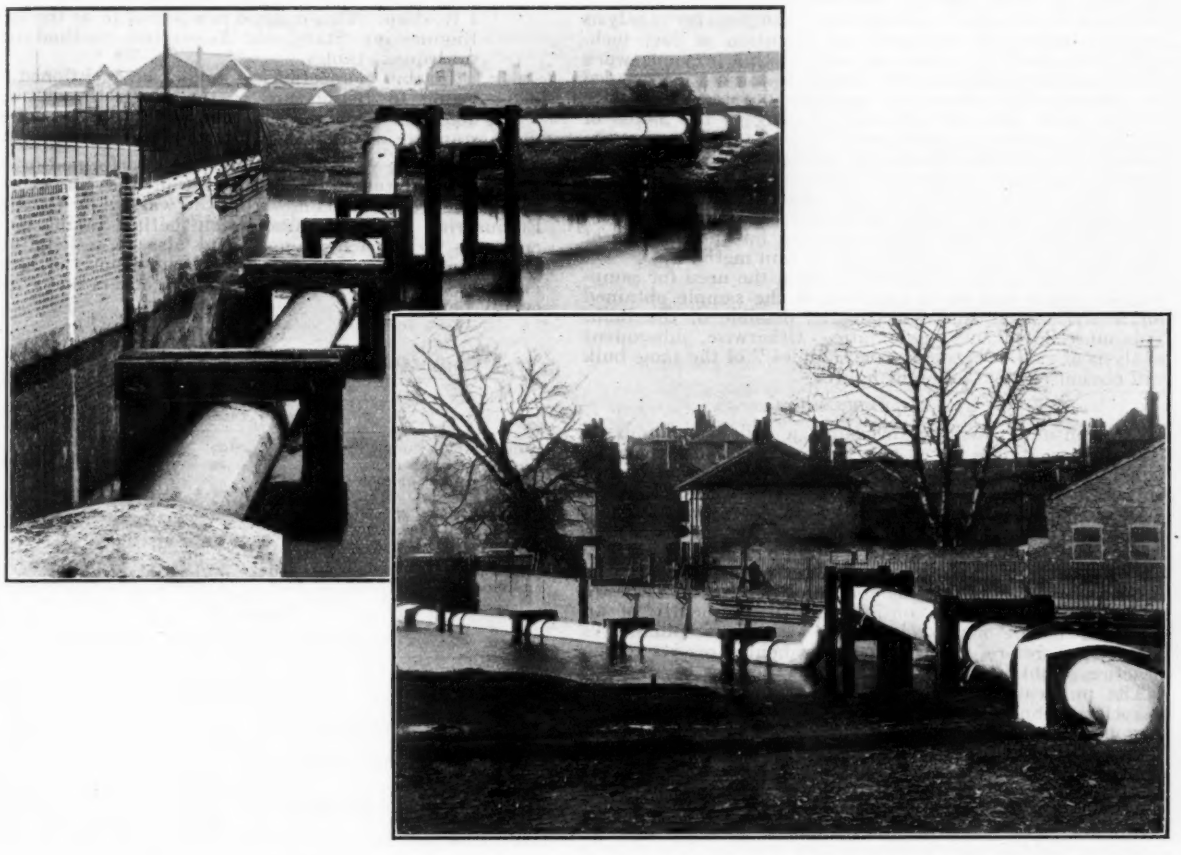


NEUTRAL BAY WORKS 1932.

STEEL PIPE CROSSING AT . . WANDSWORTH . .

A River Crossing embodying unique features

An interesting river crossing has been carried out by the Wandsworth and District Gas Company (Mr. C. M. Croft, Chief Engineer and General Manager), and, as this embodies one or two unique features, it will doubtless be of interest to our readers. The crossing forms part of a 30-in. trunk main from the Wandsworth Gas-Works to their Kingston Works, and, at the point illustrated in the photographs, crosses the River Wandle.



Photographs by H. Parker, 106, Brookwood Road, Southfields.

The conditions laid down were, first, that no structure should be allowed in the centre of the stream to interfere with the flow, and, secondly, that, as it is proposed to construct an arterial road with a bridge at this point, the pipe must conform to the proposed lay-out of the bridge.

The Wandle at this point is tidal, and the lower part of the line is submerged twice a day, the displacement producing a lift of nearly 9½ tons. Exposure to sun also causes considerable temperature changes, and a total movement of $\frac{7}{8}$ in. had to be allowed for at the expansion joint. It will be seen from this that the line is under constant movement, and it was essential that it should be as flexible as possible.

Steel tubes, 30 in. bore by $\frac{3}{8}$ in. thick, with mild steel flanges fixed on, were adopted. These were mounted on cast-iron saddles, the saddles resting in grease trays of generous dimensions, being free to slide in any direction. The trays themselves were mounted on stout 12 in. by 12 in. pitch pine piles, driven to a penetration of about 12 ft., the river bed consisting of a very hard ballast. The ends of the pipe were set in solid concrete anchors, as shown in the photograph.

To counteract the lift, the piles were cross-braced above the tube and the underside of the bracing was lined with ¼-in. steel plate $\frac{1}{8}$ in. clear of the top of the tube. In addition, the tube is anchored to the cast-iron cradles by means of steel straps, thus causing the weight of the cradles to help to overcome the tendency to float.

The bends are of wrought steel, which gives a neat appearance and offers little or no resistance to the flow.

As will be seen from the photographs, the pipe leaves the gas-works at right-angles to the bank, and then turns sharply up-stream, at the same time dropping to a lower level. This lower section will ultimately be built in solid with the foundations of the bridge, but at the moment is under water at high tide.

Expansion and contraction is taken by a single Bellows expansion joint close to the solid concrete anchor on the Company's bank.

Until the lower part of the line becomes an integral part of the bridge structure, this expansion joint does not take up its full load, as at the moment the whole line is free to move outwards.

The question of corrosion on this job is a serious one, particularly with the lower part of the line, which is between wind and water; and to prevent trouble the pipes were given two coats of a good red lead, with a further coat of suitable anti-fouling composition as used in marine practice.

The contracting work was carried out by Messrs. William Press & Son, of Westminster, the pipes being supplied by Messrs. Stewarts & Lloyds, Ltd., Glasgow.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Errors in the Sampling of Coal from Wagons*

By N. SIMPKIN (the Lancashire and Cheshire Coal Research Association).

The sampling of coal for industrial purposes is a matter which recently has been brought particularly to the notice of suppliers and consumers of coal through the publication by the British Engineering Standards Association of a Report and Specification dealing with the sampling and analysis of coal. It must not be concluded, however, that the problem of securing representative samples for analysis had not previously engaged the attention of fuel technologists. In fact, it was in view of this previous work that the British Engineering Standards Association was led to undertake the collection of available data and to initiate further work with the object of putting in the hands of interested parties a publication which would serve the purpose of providing standard methods, with a view to avoiding so much disagreement between buyer and seller due to incorrect methods of sampling and analysis. It is not intended to deal here with analysis, and such figures as are included in this paper are only for the purpose of showing the effect of sampling by certain methods.

It is not necessary to lay stress upon the need for sampling in such a way as to ensure that the sample obtained for analysis is as representative as possible of the bulk. This must be taken as axiomatic. Otherwise, subsequent analysis of two "representative samples" of the same bulk will obviously yield different figures.

General Discussion.

The consumer wishing to sample a delivery of four or five wagons of fuel is, of course, in a very unfavourable position compared with the colliery. He has either to obtain his sample from the loaded wagons or during their discharge. On the other hand, the colliery people are able to obtain a sample during the whole of the time the wagons are being loaded. The loading of wagons is usually carried out during a space of time convenient for the taking of samples, while, on the other hand, the discharge or unloading of small consignments is frequently of an irregular nature not conducive to ease of sampling. As a result, therefore, the consumer frequently resorts to the practice of obtaining his sample from the tops of wagons.

The publication of the British Engineering Standards Association Specification No. 420 deals with sampling by various methods, among which reference is made and details given of a method of sampling from wagons. Anybody, therefore, wishing to obtain a sample from wagons might follow the method as given or at least work on similar lines. Hence, a colliery company would in case of complaint have to consider whether this method of sampling yielded truly representative results. The details given below, therefore, are put forward with the object of ascertaining whether such is the case.

Details of the Investigation.

For the purposes of the investigation work was confined to dry slacks typically known as, say, 2¼ in., 2 in., or 1½ in. slacks—*i.e.*, material which has passed through a mesh of one of these sizes and contains varying amounts of smaller sizes down to dust. The tests were performed with the object of determining—

(1) Whether a representative sample could be obtained from the loaded wagon either by the method as laid down by the British Engineering Standards Association or by any other method.
(2) The source of errors or discrepancies which might arise.

In carrying out the tests, samples were in general taken as follows:

(*a*) When the wagon was being loaded a shovel or scoop was placed in the stream of coal just below the end of the conveyor delivering into the wagon. The scoop was moved across the stream from alternate sides and increments were thus obtained at definite intervals. Care was taken to ensure that each increment contained a representative sample of the full stream of coal.
(*b*) Sampling in the wagons was performed by taking a sample from a position ⅓ of the diagonal line from the corner and from the bottom of a hole at least 1 ft. deep. This method is referred to as the British Engineering Standards Association method in the subsequent tables.

In this connection, it might be mentioned that, owing to the nature of the material, a "wide" hole is necessary, as it tends to fill by the operator standing near the side in order to obtain his sample.

The following preliminary tests were performed in which samples were taken from the end of the conveyor discharging into the wagons; from the wagons by the British Engineering Standards Association method taking four increments from each wagon; and also in a longitudinal trench in each wagon, one increment from the extreme end, one 2 ft. from the other end, the others being spaced evenly between.

TABLE I.

SLACK A—through 2 in. round hole. Four wagons.

—	Conveyor Discharge.	B.E.S.A.	Trench.
Weight of bulk sample in lbs.	102	61	85
No. of increments	19	16	24
Average weight of each increment in lbs.	5·3	3·8	3·5
Total ash, p.ct.	13·0	16·1	15·1
P.ct. amount of fines through ⅛ in. sq. mesh	10·2	31·6	19·7
Ash in fines, p.ct	23·6	24·0	21·8

TABLE II.

SLACK B—through 2¼ in. square hole. Five wagons.

—	Conveyor Discharge.	B.E.S.A.	Trench.
Weight of bulk sample in lbs.	145	88	141
No. of increments	31	20	30
Average weight of each increment in lbs.	4·7	4·4	4·7
Total ash, p.ct.	15·7	17·6	23·7
P.ct. amount of fines through ⅛ in. sq. mesh	18·2	36·8	29·2
Ash in fines, p.ct.	25·9	17·6	22·3

In the above tests the number of increments was considered to be insufficient, although there are certain indications, such as the higher ash content of the B.E.S.A. samples and the higher proportion of fines present therein.

The following table indicates the type of result obtained by sampling (*a*) while loading; (*b*) from the top of the wagon by means of 12 holes, 1 ft. deep, spread over the surface; and (*c*) while discharging.

TABLE III.

SLACK C—through 2 in. round hole. One wagon.

—	Conveyor Discharge.	Top.	Discharging.
Weight of bulk sample in lbs.	202	65	181
No. of increments	43	12	44
Average weight of each increment in lbs.	4·7	5·4	4·1
Total ash, p.ct	14·6	17·9	14·6
P.ct. amount of fines through ⅛ in. sq. mesh	14·7	27·0	16·4
Ash in fines, p.ct.	26·0	25·9	24·2

It will be noted that the ash content and the fines are practically identical in the case of the "conveyor dis-

* From a paper before the North-Western Section of the Institute of Fuel.

charge " and " discharging " samples, but higher in the case of the sample from the top of the wagon.

As the work progressed, it became increasingly obvious that samples taken from the tops of wagons in the manner described in the British Engineering Standards Association Specification or modifications of this method did not give satisfactory results in the case of dry slacks. The argument might be advanced that the number of increments taken and the number of wagons was too small. If, however, certain conditions pertained in one or more wagons, there does not seem any reason why such conditions should not be common to, say, 50 or more wagons. In other words, there is a persistent error.

In order to show the actual valuation in the increments taken as compared with a representative sample taken during loading, the following figures are given:

In the case of two wagons, four samples were taken from near the corners of the wagons (B.E.S.A. method), while with a third wagon, 12 increments were taken. The holes in the latter case, which were 12 to 15 in. deep, were situated on the centre line and at each side of the wagon, commencing at one end, and then 4 ft., 8 ft., and 12 ft. from the same end, the wagon being 16 ft. long.

TABLE IV.

SLACK D—through 2 in. round hole.

—	Wagon No. 1.		Wagon No. 2.		Wagon No. 3.	
	Conveyor or Discharge.	B.E.S.A.	Conveyor or Discharge.	B.E.S.A.	Conveyor or Discharge.	Top.
Weight of bulk sample in lbs.	258	52	218	52	252	137
No. of increments	74	4	48	4	53	12
Average weight of each increment, lbs.	3·5	13	4·5	13	4·8	11·4
Total ash, p.ct.	15·3	19·3	12·2	19·1	12·6	16·4
P.ct. fines through ¼ in. sq. mesh	16·0	38·6	16·5	33·3	21·4	20·7

The tables below show the details of the individual increments from the tops of the wagons:

TABLE V.

WAGON NO. 1.

—	Individual Increments.				Average of Increments	Conveyor Discharge.
	1.	2.	3.	4.		
Total ash, p.ct.	24·6	15·2	15·9	20·6	19·3	15·3
P.ct. fines through ¼ in. sq. mesh	53·8	29·0	27·3	40·2	38·6	16·0

TABLE VI.

WAGON NO. 2.

—	Individual Increments.				Average of Increments.	Conveyor Discharge.
	1.	2.	3.	4.		
Total ash, p.ct.	17·6	21·5	19·4	17·1	19·1	12·2
P.ct. fines through ¼ in. sq. mesh	37·3	33·8	35·0	25·3	33·3	16·5

A notable feature of the above table is the absence of fines in the material taken near one end of the wagon.

In calculating the averages in Tables V., VI., and VII. above, allowance has been made for the differences in weight of the various shovelsful or increments.

From Tables IV., V., and VI. it is obvious that the sample taken according to the B.E.S.A. method has a higher ash content and a much higher proportion of fines than the sample taken during loading of the wagon (which latter is regarded as a reasonably true sample). This bears out the indications of the previous tests. It is reasonable to suppose, therefore, that such conditions will pertain if, say, 50 or 100 wagons are sampled, and a consistently incorrect sample will be obtained.

Table VII. shows that 12 shovelsful taken over the wagon in the manner indicated may exhibit very wide variation, and it is doubtful whether any reliance could be placed on samples taken in this way.

In all the above cases, sampling from wagons was carried out at the colliery soon after the filling of the wagons. Tests were, therefore, performed to determine whether a journey would cause settling of the contents of the wagon and thus alter the distribution of fines in the wagon. The fuel was sampled as it was charged into the wagons by taking increments from the end of the conveyor while four wagons were being filled. The samples thus obtained were screened to determine the fines in each wagon, and the ash determined in the representative sample of the whole consignment. The wagons were sent to their destination—about 11 miles distant—but during the journey it was necessary to shunt the wagons several times, with the result that the fuel received a thorough " shaking down." The wagons were subsequently sampled individually. Eight increments were taken from the diagonals, ⅛ of the length of the diagonal, and also ⅛ of the length from the centre of the wagon. A further sample was also taken of 22 increments from each wagon, 11 on each diagonal, evenly spaced. It was found convenient to dig a trench 12 to 15 in. or more deep, and about 15 in. wide at the bottom, and take the four increments and the further 11 from this trench, keeping the two lots of samples separate. Care was taken to remove the coal excavated in making the trench so that it would not interfere with the other diagonal trench. The fuel had obviously been shaken down during transit, and it was noted that in two cases there was a preponderance of " nutty " coal near one end of the wagon.

The fuel was again a 2-in. round hole dry slack.

The following tables show the results obtained:

TABLE VIII.

SAMPLING AT COLLIERY FROM DISCHARGE OF CONVEYOR.

Wagon Nos.	17199	1311	16676	7008	Total of Four Wagons.
Weight of sample taken in lbs.	219	249	221	159	848
No. of increments	39	36	37	29	141
Average weight of each increment, lbs.	5·6	6·9	6·0	5·5	6·0
P.ct. through ¼ in.	8·4	17·3	13·6	15·4	13·7
P.ct. ash of whole sample.	..	..	..	..	8·1

TABLE IX.

SAMPLING AT DESTINATION BY B.E.S.A. METHOD.

Wagon Nos.	17199	1311	16676	7008	Total of Four Wagons.
Weight of sample taken in lbs.	54½	37½	45	41	178
No. of increments	8	8	8	8	32
Average weight of each increment, lbs.	6·8	4·7	5·6	5·1	5·6
P ct. through ¼ in.	16·5	29·3	23·6	25·6	23·2
P.ct. ash in through ¼ in.	18·1	16·2	13·7	16·9	16·1
P.ct. ash in whole sample.	9·2	11·0	8·0	10·6	9·6

TABLE X.

SAMPLING AT DESTINATION BY DIAGONAL METHOD.

Wagon Nos.	17199	1311	16676	7008	Total of Four Wagons.
Weight of sample taken in lbs.	110	99	86	79	374
No. of increments	22	22	22	22	88
Average weight of each increment, lbs.	5	4·5	3·9	3·6	4·3
P.ct. through ¼ in.	15·6	25·0	22·9	23·3	21·4
P.ct. ash in through ¼ in.	17·5	15·9	14·5	17·1	16·1
P·ct. ash in whole sample	9·6	11·3	8·0	9·4	9·6

In calculating the last column in each table, allowance

TABLE VII.

WAGON NO. 3.

—	End.			4 Ft.			8 Ft.			12 Ft.			Average.	Conveyor Discharger.
	Sides.		Centre.	Sides.		Centre.	Sides.		Centre.	Sides.		Centre.		
Total ash, p.ct.	8·2	13·7	12·6	18·1	8·8	18·0	9·1	26·5	28·8	12·7	12·6	16·6	16·4	12·6
P.ct. fines through ¼ in. sq. mesh	1·4	1·9	4·8	33·7	6·7	44·4	4·4	26·0	26·7	17·4	23·2	40·2	20·7	21·4

has been made for differences in weights of the samples from each wagon.

It will be seen from Tables VIII., IX., and X. that sampling from the tops of wagons in the manner indicated yields samples which are not representative of the contents of the wagon in that (*a*) the percentage of fines is far too high, and (*b*) the ash content is also high. The importance of point (*a*) becomes apparent when it is remembered that an undue amount of fines frequently forms the basis of a customer's complaint. No colliery, therefore, should consider any complaint based on samples taken from the tops of wagons of dry slack.

Individual increments taken from wagons by the B.E.S.A. method tend to contain a higher proportion both of ash and fines in the case of the dry slacks examined. Hence, one would naturally expect that if this method of sampling were applied to, say, 100 wagons, the results obtained would be incorrect—*i.e.*, the sample obtained would show higher ash and fines contents than the truly representative sample. The figure may be up to 5 or 6 p.ct. higher than the true figure for ash, and up to 20 p.ct. or more for percentage of fines. Neither a colliery firm nor a consumer would, therefore, be justified in accepting the analyses of samples obtained by this method.

Other methods of sampling from wagons by means of diagonal trenches or a large number of increments taken from the bottom of holes dug into the fuel also yield unsatisfactory results.

It is concluded, therefore, that in the case of dry slacks,

(*a*) Wagon sampling by the method given in British Engineering Standards Association specification yields results which are incorrect and unreliable, since they would tell against the seller by showing too high an ash content and too much fines.

(*b*) The only satisfactory method found so far is to sample the fuel by taking increments as the wagons are being filled or emptied.

In the latter case, more necessary than in the former, increments must be taken during the whole of the unloading period. This is necessary, as the fuel segregates in each wagon, coarse sizes settling at the bottom and sides during loading, the fines tending to be in the middle and on top. This raises the very interesting point of the possibility of loading slack into wagons so that separation of coarse and fines will not occur.

It is obvious that the sampling of dry slacks, like those dealt with in this paper, presents an entirely different problem from that involved in the sampling of more uniform material, such as washed fuels and graded sizes.

Carbonization of Coal with Electricity*

By H. S. Walker, Engineer, Research Department, Detroit Edison Company.

Why not use off-peak electricity for the conversion energy required to carbonize coal? The question is one of economics rather than engineering. In this paper the author will treat of a process for carbonizing coal with electricity that must needs make an economic appeal to the Gas Industry. The process produces gas, coke, and bye-products practically similar in quality and quantity to those obtained by the high-temperature carbonization of coal in ordinary ovens and retorts. In other words, the coal used and the products made are substantially the same as those we are well acquainted with in the manufactured Gas Industry; only the equipment and form of conversion energy are different.

It might be well to state here that the author is not a gas expert or primarily a gas man by either education or profession. He has made, however, quite a study of the Gas Industry, its problems, processes, and costs of operation, &c., for several years. This study has been supplemented with the design, erection, operation, and testing of two experimental carbonizing plants for the Detroit Edison Company—a public utility in the middle western part of the United States. It operates in the City of Detroit and South-Eastern Michigan, and does practically all the electrical business in an area of 4400 square miles populated by 2,275,000 persons. Electric service is provided for approximately 550,000 customers. In addition to the manufacture and sale of electricity, the Company does a steam heating business in Detroit, and owns and operates, among other enterprises, a water gas plant with a daily output of 1,200,000 c.ft. of 530 B.Th.U. gas. The output is sold to approximately 11,000 customers in the City of Port Huron, three smaller cities, and seven villages. The Company's entry into the gas business was in 1920, when at that time it purchased the municipal plant in Port Huron, which was replaced in 1925-26 with a new plant. The erection of this plant was shortly prior to the Company's acquaintance with the process to be discussed. With this outline it must be recognized that the Detroit Edison Company is more or less "gas minded."

We became interested in the process, an invention of Mr. Harold B. Stevens, because we were in both the gas and the electricity business, and could see that certain economic advantages might be derived from the use of it in our own territory and in other locations where there was, first, a market for gas, and, second, available off-peak electrical energy. Looking at the process through two pairs of eyes, the gas man's and the electrical utility's, it was decided that in a great many locations, including our own district, the off-peak power available, a source of low cost energy, would be more than enough to produce the gas consumed in the adjacent areas. At the same time the quantity of off-peak energy consumed would be a very desirable electrical load. The inventor's figures, based on some early work he had done on a 200-lb. retort, were used in the original calculations. To check these figures and to provide additional information that would be useful in forming more definite conclusions, it was decided to build a 1½-ton retort. This retort was operated for a period of approximately three years and until such time as the results indicated that our further interest in the process would be warranted. The economies to be effected by the utilization of larger units than the 1½-ton were recognized, and just prior to the completion of the testing of this unit a 30-ton experimental retort was designed. This was followed by the erection, operation, and testing of a commercial sized unit during the ensuing two or three years. At the termination of this time the development of the process had been continued to such a stage that the practicability of it had been proved to our satisfaction. At the same time, the inroads that natural gas was making into the sale of manufactured gas were such that the immediate utilization of the process in our territory did not appear to be prudent.

Principle of the Process.

The process as developed is an intermittent one, although it could quite readily be made continuous. The retorts have been of the vertical type, cylindrical in shape.

The use of electricity for carbonizing is effected as follows: Electrical energy is passed through what we have called a starting fuse in the mass of coal. This starting fuse is, in reality, a column of coke breeze in a suitable container. The passage of electricity through this fuse heats it. The heat of the fuse is conducted to the adjacent coal and carbonizes it. When the adjacent coal has been carbonized it becomes a relatively good conductor of electricity compared with the starting fuse and in contrast with the uncarbonized coal. Electricity then flows not only through the fuse but through the carbonized coal or coke also. By this the coal adjacent to that originally carbonized is heated, carbonized, and then becomes an electrical conductor, so that a constantly increasing coke core is produced which forms a larger and larger path for electrical flow. As the carbonizing continues the coke core increases until the complete charge or mass is carbonized. It will be seen by this that the heat for carbonizing is applied initially at the surface of the coal and later generated within the coal, and does not have to pass through a containing wall and then through an increasing thickness of carbonized coal as in the common types of processes. This very efficient application of heat results in a very fast rate of coking. In fact, rates of 4 in. an hour (on a diameter in a cylindrical retort) are not uncommon.

The gases (both permanent and heated condensate) pass out through the mass of uncarbonized coal, and in doing so give up to this coal a considerable part of their sensible heat. This direction of gas passage is effected by the design of the retort.

Single phase alternating current is used, although in a battery (three or more) multiple phase energy might well be utilized.

The upper electrode is electrically insulated. In operation the lower door or bottom cover of the retort is first put in place. The starting fuse is then set on the lower electrode and the retort filled through the upper opening

* From a paper as read before 25th Annual Convention Canadian Gas Association, June 9 and 10, 1932.

with coal. The top cover or plug is then placed in position and the electrical energy supply turned on. The evolution of gas follows the initial passage of electricity in a few minutes. When the charge has been completely processed the quick opening doors on the offtakes are opened, the escaping gas ignited, and the top cover removed. The lower door is then removed and the coke falls by gravity into suitable equipment.

Technical Results.

The products obtained by carbonizing coal by this method indicate that the process is perhaps intermediary in the field of high and low temperature carbonization. The quality and yield of gas and coke closely approximate those of the high-temperature distillation processes. The type of condensate or tar resembles that produced in many low-temperature processes, while the yields approximate those obtained in the high-temperature processes. All the products are of a type that can be readily sold, and it would not be necessary to create new sales fields. The coal, except a few runs, was not blended, so that most of the coke would be considered gas coke. This fuel was tried by about thirty different persons in various types of house heating furnaces with considerable success and favourable comment, especially as to the ease with which it ignited.

The process is very flexible as to the use of different coals of various sizes.

Flexibility of control is an extremely important feature. In several instances a retort was started from a cold condition, and in fifteen minutes was producing gas. Conversely the processing can be quite readily stopped.

An interesting result is the relatively high rate at which a charge can be processed. While the permissible rate, in order to get the higher quality of gaseous products, is somewhat dependent on the retort diameter, rates of 4 in. per hour on a diameter are quite possible.

All our studies of the economic possibilities of the process have resulted in the following conclusions:

1. The capital costs of a plant operating under this process or method would not be more than for a plant manufacturing coal gas with ovens or retorts as ordinarily used. In fact, it is believed that the capital cost would be considerably less.
2. The maintenance charges should not be higher.
3. The operating costs should be the same or less.
4. The conversion energy costs, when segregated from the operating costs, should offer quite a distinct saving to the gas manufacturer and a favourable return to the producer of the electricity.
5. The market value of the products should be equal to that of the products from other types of coal gas plants.
6. It is fully appreciated that actual figures are, of course, desirable, but due to the variations in costs of operating materials, including coal and labour in different localities, as well as the variations in plant costs by reason of location and other factors, such a set-up cannot be made until all specific information for a given location is available.

Parkinson & Cowan, Ltd.

Re-Organization Progress

The Thirty-Second Ordinary General Meeting of Parkinson & Cowan, Ltd., was held on Friday last at the Institute of Chartered Accountants, Moorgate Place, E.C.

Lieut.-Col. H. W. Woodall, C.I.E., M.Inst.C.E. (Chairman and Managing Director), before dealing with the accounts, referred in sympathetic terms to the death of the late Chairman of the Company, Sir Henry Cowan. Continuing, he said: The firm of W. Parkinson & Co. was founded in 1816 and the Cowan business in 1825, and it is one of my unwelcome duties to be the first Chairman of the combined Companies to have to advise the shareholders that not only is there no ordinary dividend but that the full preference dividend for the year has not been paid. In such circumstances it would be straining your credulity to claim that all is well with the Company, and, since I joined the Board a few months ago, my efforts and those of my colleagues have been directed to finding how it is that in recent years this Company should have fallen from a position of affluence to one of considerable difficulty.

Policy of the Board.

What we are endeavouring to do is to re-organize our affairs on a new basis that will enable the available wealth, brains, and energy of the Company—and it possesses all three in no small measure—to be utilized to the very best advantage and with the least delay.

During the last few weeks we have had the valuable assistance and co-operation of Sir Harold Snagge, who has now joined us as a Director of the Company after a most careful examination of the accounts and the manner of their presentation to you, in which rather intricate and important investigation he, and all of us, have had the advantage of the counsel and advice of the Company's Auditors, Messrs. Cash, Stone, & Co., and of Col. P. E. Harding, of Messrs. James Edwards & Harding, the well-known firm of chartered accountants. Let me hasten to add that, while I think a too optimistic view has been taken for some years past of the value of some of the Company's assets, and that a distribution of profits on a smaller scale would have been a more prudent course to pursue, nothing of a disquieting nature has emerged from our examination of the accounts nor any operations which call for condemnation rather than criticism.

In referring to the balance-sheet items, the Chairman said that the value of investments in Subsidiary Companies had been written down by £63,192, adding: The larger portion of the depreciation is consequent upon the decision of the Directors to close down the operations of Domestic Electrification, Ltd., one of the Company's Subsidiaries which has made losses since its formation in 1927. He also pointed out that all losses in subsidiaries had been provided for in the Company's accounts, and that undivided profits in other subsidiaries had been left in their accounts. Continuing, he said: We recognize the hardships imposed on shareholders by the failure to earn dividends in recent years, but we are satisfied that only by dealing with the position as we now recommend can we hope to resume the payment of dividends at a reasonable date and on a thoroughly sound basis. When the proposed writings off have been completed, we believe that all the dead wood will have been cut out and that the reserve account in its diminished form will be entirely free and available for the purposes of the Company.

The Company's Works.

So far I have dealt only with the subject of accounts. When it comes to the question of works we have again a somewhat mixed showing. We own some of the best works of their kind in this country and the Dominions. Others not quite so good are receiving consideration in connection with re-organization schemes which are before us. Our Company has very important investments in Australia. It could not be hoped that our interests would remain unaffected in the face of the collapse of trade in the Commonwealth, but every effort is being made by our Directors on the spot to effect economies and restore output, and we here are rendering every assistance that is possible from so great a distance. But when all is said and done, the prosperity of this Company has been built up in Great Britain, and the home trade is still, and will, I think, long remain, the backbone of our business. What happens elsewhere may affect dividends, but what happens here affects the very existence of the Company.

The good work that Parkinson & Cowan did in the early days is not forgotten, and I believe that nowhere are the affairs of the Company being followed with greater sympathy than among its old friends of the Gas Industry, with whom, through its associated Companies, it has been connected for over a century on terms of mutual respect and goodwill.

Confidence in the Future.

The widespread nature of our operations, while at present a handicap, will, I hope, ultimately justify the courage and optimism of the late Chairman and of those who were associated with him in acquiring them.

These are difficult times in which to make up lost ground, and it would be unwise—indeed it would almost be presumptuous—for one who has been on the Board of this Company but a few months to venture upon prophecy. But I am, as I have already said, much impressed by the possibilities of this Company, and there is reason to hope that no long time will elapse before we recover once again our old position in the forefront of the industry. The Board have decided that in future the annual accounts of the parent Company and all its subsidiaries shall end on Dec. 31 in each year.

In conclusion, the Chairman said he had been very greatly impressed by the high standard of attainment prevailing among the Company's officers and was very appreciative of the loyal, strenuous, and efficient service afforded by the staff ever since he joined the Company.

The Chairman moved the adoption of the report and accounts, which was seconded by Mr. W. W. Parkinson (Deputy-Chairman), and carried unanimously.

The New Directors.

Mr. W. W. Parkinson, in proposing the re-election of Lieut.-Col. H. W. Woodall as a Director of the Company, said that Col. Woodall's knowledge and connections with the Gas Industry, and his experience and ability both in the profession and in commerce, made it certain that the shareholders were to be congratulated on his consent to join the Board.

Mr. L. A. Stride, in seconding the motion, said he spoke as representing something like 250,000 shares. After having listened to the Chairman's explanation of his policy, he was sure that the shareholders would agree with him that the Chairman should have every assistance in carrying that policy

through. Col. Woodall had an exceedingly difficult job to deal with, and it was as well that he should feel he had the support of outside shareholders if it happened that he had to do some of those unpleasant jobs which sometimes fell to the lot of a re-organizing chairman. He would also like to take the opportunity of saying that they welcomed the addition of Sir Harold Snagge to the Board. He wished also to congratulate the Chairman on the form of the balance-sheet this year; they felt that it was a statement of facts. He hoped that perhaps in another year the Directors would be able to give them something in the nature of a combined balance-sheet.

The motion was carried unanimously.

The CHAIRMAN, having thanked the meeting for his re-election, moved the confirmation of the election of Sir Harold Snagge, K.B.E., as a Director of the Company. Sir Harold was a Director of Barclays Bank and the Atlas Assurance Company. The value of his wise and balanced judgment and his experience in banking, accountancy, and business affairs to this Company it would be impossible to exaggerate.

Mr. W. W. PARKINSON seconded the motion, which was carried unanimously.

Sir HAROLD SNAGGE briefly acknowledged his re-election.

Sir William S. Haldane, W.S., the Director retiring by rotation, was also unanimously re-elected.

Messrs. Cash, Stone, & Co. were re-appointed Auditors.

Mr. COLES, in proposing a cordial vote of thanks to the Chairman, Directors, Managers, and staff, said that, speaking as a customer of the Company as well as a shareholder, and as one who was interested in the Gas Industry, he looked forward with considerable confidence to the future of Parkinson & Cowan.

Mr. OSWALD CLOUDESLEY seconded the motion, and it was carried unanimously.

Gas Companies' Results.

Crewkerne.

The revenue account of the Crewkerne Gas and Coke Company shows a balance of profit as a result of the year's working to June 30, 1932, of £1563. The sale of gas for the year has been 33,875,000 c.ft., an increase of 1,139,500 c.ft. The total number of consumers is now 1092, an increase of 30 during the year. The profit and loss account, after paying the interim dividend and allowance for depreciation of plant, shows an available balance of £2398, from which amount the Directors recommend dividends to be paid at 3 p.ct. on the preference shares, making with the interim dividend paid in February, 6 p.ct. for the year (less income-tax), and 6 p.ct. on the ordinary shares, which, with the interim dividend paid, will make 10 p.ct. for the year (free of income-tax). A new steam engine and exhauster has been erected during the year to replace old plant.

Grantham.

The Grantham Gas Company agreed on a dividend of 5 p.ct., the transfer of £500 to the reserve fund, and the carrying forward of the balance, £5184. Dr. G. A. C. Shipman, who presided, said that about 3 p.ct. less gas had been sold during the half-year, as compared with the corresponding half of last year. There was a balance on the profit and loss account of £7184. He added that the Special Order they were asking for, to amend and expand, had been deposited with the Board of Trade.

Harpenden.

A slight increase in the sales of gas was reported at the annual meeting of the Harpenden Gas Company. In presenting the report of the Directors and the statement of accounts for the year, Mr. C. Holmes Hunt (Chairman) mentioned that despite the increase in sales, there was a small decrease in the make of gas for the corresponding period, thus showing that the gas unaccounted-for had been reduced. He was glad to inform the shareholders that the percentage of leakage was now standing at a very low figure. The demand for gas appliances of all descriptions had been consistently maintained. There had been 155 new consumers added during the twelve months, 148 cookers were sold, and, in addition, 95 cookers had been fitted up for new slot consumers; there were also 85 gas fires sold, 85 coppers, 16 geysers, 16 radiators, and other sundry appliances. Turning to the revenue account, the total sales of gas showed a decrease of £451, this being largely due to a reduction in the price of gas which was made at Michaelmas last. The revenue from coke again showed a very satisfactory increase, and the sales of tar were more than last year. It was gratifying to note that more gas-works tar was being used on the roads, owing to its non-skid qualities. On the debit side, repair and maintenance of works showed a decrease of £886, whereas in the distribution of gas, repair and maintenance of mains came to £676 more. The total revenue carried to profit and loss account was again more than in the previous year, and a dividend at the rate of 8 p.ct. per annum on the ordinary stock (6 p.ct. standard), less tax and subject to the interim dividend already paid as recommended, was declared.

Shrewsbury.

The gross profit of the Shrewsbury Gas Light Company for the year ended June 30 last amounted to £9364, and after allowing for the interim dividend of 2½ p.ct. (less tax) paid in March last, and the interest on mortgages for the year, the balance of net profit available amounts to £12,456. The Directors recommend that a final dividend of 4¼ p.ct. (less tax), making 6¾ p.ct. (less tax) for the year, be now declared, pay-

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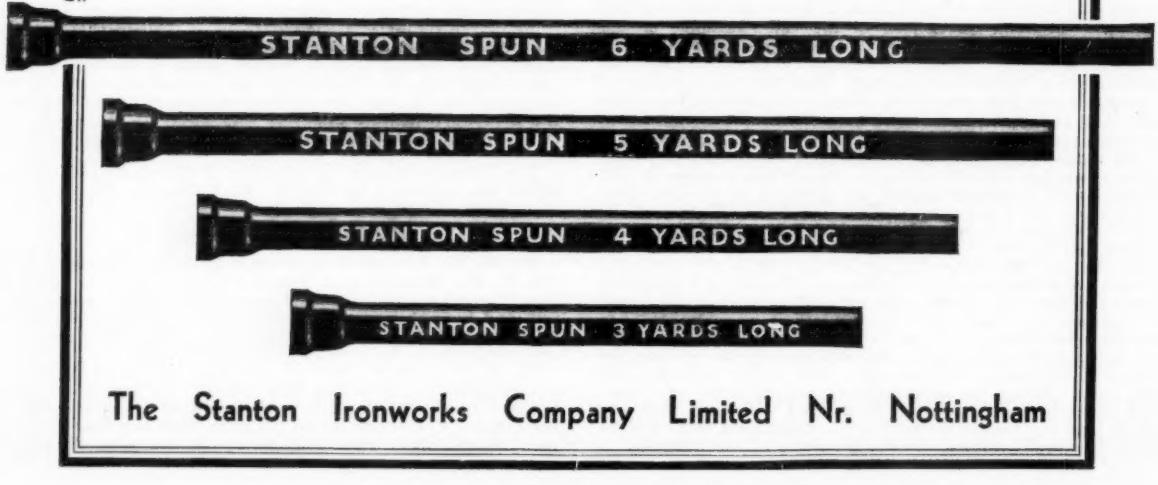


The Stanton Ironworks Company Limited Nr. Nottingham

able on and after Sept. 2, 1932. The reserve fund now stands at £13,334. New carbonizing plant has been installed at the North Works, together with the necessary auxiliary plant and machinery. The cost of this work has been divided between capital account, special purposes fund, and renewal fund. There has been a decrease of a little over 1½ p.ct. in the sales of gas during the year, due to the general business depression. The number of cookers on hire at June 30 was 5104, together with 2226 fires and radiators. There were also 3340 ordinary and 6413 prepayment meters in use. In addition, the total sales of gas cookers, fires, water heaters, &c., amounted to 660.

Wellingborough.

The Directors of the Wellingborough Gas Light Company, Ltd., present accounts for the year ended June 30, 1932, which show that an interim half-year's dividend of £4206 was paid on March 1. After providing for interest and income-tax there remains an available balance of £9999. The Directors recommend that dividends at the same rate as before (7½ p.ct. on the "original" and 6 p.ct. on the "additional" shares, less income-tax) be declared for the half-year, and paid to the shareholders on Sept. 1. The payment of dividends and tax thereon will absorb the sum of £4206, leaving a balance of £5792 to be carried forward. Satisfactory progress has been made with the erection of the vertical retorts referred to in the last report, and it is expected that they will be brought into use early in the autumn. The item of £1200 appearing as a deduction from the capital account is explained by the fact that the Directors have sold a portion of the land held by the Company, having satisfied themselves that it will not be required for future extensions. Substantial reductions have been made in the price of gas for power and industrial purposes. The Directors were pleased to note the acceptance by the Wellingborough Urban District Council of the Company's tender for fitting up 138 houses on the new Roberts Street housing estate, for both lighting and cooking.

Corporation Undertakings' Results.

Oswaldtwistle.

The total quantity of gas sent out amounted to 118,564,000 c.ft., an increase of 142,000 c.ft. over the preceding year. Gas sold increased by 476,300 c.ft., or 0·44 p.ct. Ordinary meters show a decrease of 2,982,300 c.ft.; prepayment meters an increase of 2,174,000 c.ft.; and gas used for industrial purposes has increased by 906,900 c.ft. Unaccounted-for gas decreased by 334,300 c.ft. A total of 8789 tons of coal was received during the year 8661 tons being carbonized; 40 tons sold, 66 tons used on works; the stock being increased by 22 tons. The net income from residuals, after deducting cost of handling, carting, &c., was £4978, as against £5297 last year, a decrease of £324. Appliances sold during the past seven years total 3104, and bearing in mind the very acute trade depression prevalent in the area, the sales and installations are satisfactory. Cookers in use, the property of the Council, number 658. Of these, 592 are supplied free to slot meter consumers, and 66 are on simple hire to ordinary meter consumers. Street lamps in Oswaldtwistle consumed 6,477,000 c.ft. Improvements in lighting have been effected in Blackburn Road, and several of the more important side streets, by the adoption of modern burners and reflectors. It is hoped that further improvements will be carried out during the current year. The gross profit on the year's working was £4370. Against this is charged sinking fund instalments £1919, interest on loans £1834, income-tax of £3; making a total of £3756, leaving a net profit for the year of £1067. This amount has been transferred to revenue appropriation account.

Register of Patents

Prepayment Mechanism.—No. 368,324.

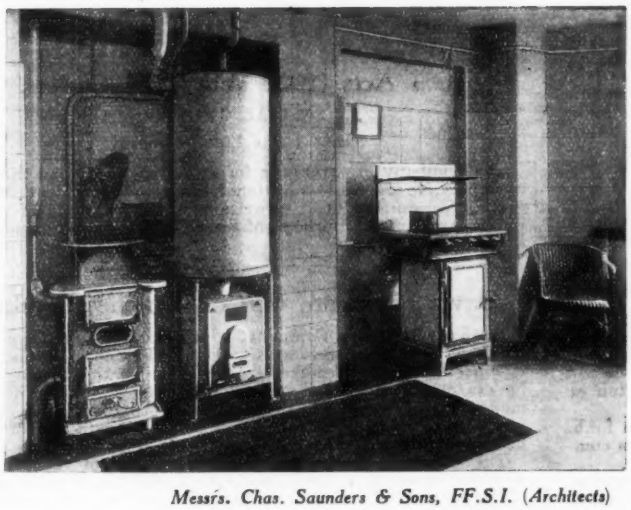
METERS, LTD., of Manchester, and GLOVER, W. T., and MAYLOR, J. A., both of Oldham.

No. 35,829; Nov. 28, 1930.

This invention relates to prepayment mechanism for gas meters of the type wherein a change-speed gear is interposed between a part operated from the metering mechanism and the part which causes the traversing of a nut or wheel in one direction, the prepayment mechanism causing the traversing of such nut or wheel in the other direction.

The invention consists in the improved two-speed gear comprising bevel wheel and worm gear drives controlled by a bell crank lever from a part which projects into the quantity wheel and is separate from the spindle driving the valve operating gear, the part for one setting of the coin holder being engaged and moved by a member upon the coin holder so as to bring one drive into service, the other drive coming into service when the coin holder is adjusted to move the member clear of the part which projects into the quantity wheel.

COMFORT IN THE HOME



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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The general tone of markets remained cheerful last week. The chief event continued to be the strength of the gilt-edged section, for the sharp reaction which took place early on by reason of a large profit-taking movement was almost completely wiped out by the time the week closed. Another satisfactory feature was the further expansion of business in many other sections, and some substantial improvements were recorded—particularly in leading industrials, oil, and mining shares—while even rubber shares participated in the upward movement.

Gas Stocks and Shares continued unaffected by any outside influences. The market is usually short of supplies at this time of the year owing to the close proximity of dividend disbursements, and the bulk of the business centred round Gas Light units, South Metropolitan, and Imperial Continental ordinaries.

Derby consolidated and 4 p.ct. debenture show increases of 5½ and 12½ points respectively.

Some inquiry for European raised the price 3 points to 103, and South Metropolitan 6 p.ct. preference gained 2½ points to 132½. The marking down of many of the stocks was due generally to the quotations being *ex* dividend.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Aug.* 15.

There is no change to report in the prices of tar products, which remain as follows:

Pitch, 95s. to 97s. 6d. per ton f.o.b.

Creosote, 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4¼d. per gallon in bulk at makers' works. Pure toluole is about 2s. 6d.; pure benzole, about 1s. 8d.; 95/160 solvent naphtha, 1s. 4½d. to 1s. 5d.; and pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar and Tar Products in the Provinces.

Aug. 15.

The average prices of gas-works products during the week were: Gas-works tar, 34s. 6d. to 39s. 6d. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 3d.; low gravity 1¾d.; Scotland, 2½d. to 3d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 7½d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 13.

Market remains dull with quotations somewhat irregular. Coal tar pitch is firm, however, and supplies for export are difficult to secure.

Crude gas-works tar.—Actual value is 55s. to 60s. per ton *ex* works.

Pitch.—Export value is nominal at 85s. to 90s. per ton f.o.b. Glasgow for export. In the home market small quantities command 90s. to 95s. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification.—Quotations are unchanged at 4¼d. to 4½d. per gallon *ex* works naked with demand below normal.

Creosote oil.—While prices are steady, throughput has fallen during the week. B.E.S.A. Specification is 3¼d. to 3¾d. per gallon; low gravity, 3¾d. to 4d. per gallon; and neutral oil, 3¾d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid.—Values are, if anything, easier. Pale, 97/99 p.ct., 1s. to 1s. 1d. per gallon; dark, 97/99 p.ct., 11d. to 1s. per gallon; and pale, 99/100 p.ct., 1s. 2d. to 1s. 3d. per gallon; all f.o.r. in buyers' packages.

Crude naphtha.—Supplies are scarce with value steady at 4½d. to 5d. per gallon, according to quality.

Solvent naphtha is in poor request at 1s. 2d. to 1s. 3d. per gallon for 90/160 grade, and 11d. to 1s. per gallon for 90/190 grade.

Motor benzole.—Quotations are steadier owing to expectations of a rise in petrol. To-day's value is 1s. 2½d. to 1s. 3½d. per gallon f.o.r. in bulk.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s.	d.		s.	d.	
Crude benzole	0	8½	to	0	9	per gallon at works
Motor ,, ...	1	3½	,,	1	4	,, ,, ,,
Pure ,, ...	1	7	,,	1	8	,, ,, ,,

Trade Notes.

"Simplex" Water Gas Plant for Newport (Fife).

The Town Council of Newport (Fife) have placed an order with the Vertical Gas Retort Syndicate, Ltd., of 17, Victoria Street, Westminster, S.W. 1, for an improved type "Simplex" water gas plant. This will constitute the second installation at their gas-works.

Contracts Advertised To-Day.

Coal.

Tenders are invited by the Bingley Urban District Council for the supply of gas coal. [Advert. on p. 358.]

Mains.

Tenders are invited by the Pontefract Gas Department for mains and services. [Advert. on p. 358.]

The Milford Haven Urban District Council invite tenders for the supply and delivery of steel mains and specials. [Advert. on p. 358.]

Meters.

The Pontefract Gas Department invite tenders for gas meters. [Advert. on p. 358.]

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Swansea Gas Light Company.

The Company are applying for authority to extend the limits of supply, to purchase additional lands by agreement, to raise further capital, to make provision as to the price of gas for public lamps in the Borough of Swansea, and for other purposes.

Davey, Paxman, & Co. (Colchester), Ltd.

We learn that this Company, which was registered on Aug. 2 to take over the business of Davey, Paxman, & Co., Ltd., Engineers and Boilermakers, is continuing the production of boilers, steam and Diesel engines, and other specialities formerly made by their predecessors, in addition to the manufacture of special machinery which has, prior to the introduction of tariffs, been manufactured abroad.

The Company is under the Chairmanship of the Rt. Hon. Viscount Goschen, G.C.S.I., G.C.I.E., C.B.E., with a Directorate of gentlemen of extensive financial and business experience. Generally speaking, the personnel of the old Company will be retained, thereby ensuring absolute continuity of policy, experience, manufacture, and service. The active management of the business will be in the hands of Mr. P. A. Sanders, O.B.E., A.M.I.Mech.E., and Mr. E. P. Paxman, M.A., whose long association and intimate knowledge of the old Company's products will assure the maintenance of the high standard of quality associated with Paxman manufactures which have been supplied to all countries throughout the world.

The Head Office and Works will be at Standard Ironworks, Colchester, Telephone, Colchester 3151, while their London Office will be at Aldwych House, W.C. 2, Telephone, Holborn 4966.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Aug. 12.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Apl. 4	7½	7½	Alliance & Dublin Ord. ...	100—110	...	...
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	75—80	...	77—78½
657,655	,,	Mar. 14	7	7	Barnet Ord. 7 p.c.	135—145	...	...
300,000	1	Apl. 29	1/4½	1/9⅛	Bombay, Ltd.	15/—20/-	...	...
177,750	Stk.	Feb. 29	9	9	Bournemouth sliding scale	180—190	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	137—147	...	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	130—135	...	131
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	90—95	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
357,900	,,	Mar. 14	7½	7½	Brighton, Hove, & Worthing 6 p.c. Con. ...	135—145	...	141
540,000	,,	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	120—130	...	126—127½
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	129—134	...	133
1,287,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	107—109a*	−2	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	92—94a	+1	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	90—94a	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120a	...	...
855,000	,,	Apl. 4	7	8	British Ord.	132—142	...	134—137
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	120—130	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	87—92	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	114—119	...	...
100,000	10	May 23	6	6	Cape Town, Ltd.	7½—8½	...	...
100,000	10	Apl. 29	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	80—90	...	89½
626,860	,,	Aug. 8	6	6	Cardiff Con. Ord.	98—103*	−2	...
237,860	,,	July 4	2⅔	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Aug. 8	6⅔	5	Chester 5 p.c. Ord.	89—94*	...	...
98,936	1	May 23	2/-	2/-	Colombo, Ltd. Ord.... ...	26/—31/-	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Apl. 4	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	10/—15/-	...	...
2,078,280	Stk.	Aug. 8	5⅔	5	Commercial Ord.	102—107*	−½	103½—106½
475,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
807,560	,,	Aug. 8	7	7	Croydon sliding scale ...	130—140*	−2	136⅜
469,590	,,	,,	5	5	Do. max. div.	95—100*	...	...
600,000	,,	July 4	5	5	Do. 5 p.c. Deb.	115—120	...	118—120
642,270	,,	Aug. 8	10	7	Derby Con.	120—130a*	+5½	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb.	75—85c	+12½	...
209,000	,,	Mar. 14	5	5	East Hull Ord. 5 p.c. ...	94—99	...	...
179,500	,,	Feb. 29	5⅔	5⅔	East Surrey Ord. 5 p.c. ...	110—120	...	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb. ...	114—119	...	...
1,002,180	,,	Mar. 14	14	16⅔	European, Ltd.	98—108	+3	100—105½
19,405,992	,,	Aug. 8	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	22/6—24/6†	−/6	23/0⅔—23/9
2,600,000	,,	,,	3⅜	3⅜	Do. 3½ p.c. max.... ...	80—85*	−1	80½—82⅜
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	95—100*	−1	97⅝—99
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	75—80	...	76⅔—78½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	108—113	−1	110⅛—111⅝
2,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	105—110	...	106⅛—107⅛
264,011	,,	—	—	—	Harrogate New Cons. ...	106—111	...	...
82,500	,,	Mar. 14	7	7	Hastings & St. L. 5 p.c. Conv.	120—130	...	...
258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv.	90—95	...	...
70,000	10	June 6	†5	†10	Hongkong & China, Ltd. ...	10—11	...	...
213,200	Stk.	Feb. 29	6	6	Hornsey Con. 3½ p.c. ...	105—110	...	...
5,600,000	,,	June 6	15	14	Imperial Continental Cap.	187—197	+2	186½—195
223,130	,,	Aug. 8	3⅛	3⅛	Do. 3½ p.c. Red. Deb.	81—86*	−1	...
235,242	,,	Aug. 8	8⅝	8¾	Lea Bridge 5 p.c. Ord. ...	142—152*	−3	...
2,145,907	,,	Feb. 29	6	6	Liverpool 5 p.c. Ord. ...	111½—112½b	...	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110b	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	85½—90½b	...	...
165,796	,,	Feb. 15	8	10	Maidstone 5 p.c. Cap. ...	155—165	...	...
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	65—70	...	...
76,000	£	June 20	†10	†10	Malta & Mediterranean ...	7½—8½	...	...
892,000	—	Apl. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	95—100	...	...
171,978	Stk.	Feb. 29	5	5	M. S. D. Utility "C." Cons.	88—93	...	...
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	82—87	...	...
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	87—92	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...	...
675,000	,,	21 May '31	†6	†6	Montevideo, Ltd.	40—60	...	...
2,061,315	,,	Feb. 29	5	5⅔	Newcastle & Gateshead Con.	21/6—22/6d	+·/9	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	89½—90½d	−1½	...
691,705	,,	June 20	3½	3½	Do. 3½ p.c. Deb. ...	88—90d	−1	89
277,285	,,	Apl. 29	5	5	Do. 5 p.c. Deb. '43. ...	105—110d	...	...
274,000	,,	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	86—87a*	−1½	...
199,940	,,	Mar. 14	7½	7½	North Middlesex 6 p.c. Con.	135—145	...	...
896,160	,,	Aug. 8	5	5	Northampton 5 p.c. max. ...	88—93*	−4½	...
300,000	,,	Apl. 18	9	7	Oriental, Ltd.	85—95	...	...
205,162	,,	June 20	8	8	Plym'th & Stonehouse 5 p.c.	140—150	...	...
504,416	,,	Feb. 15	8	8	Portsm'th Con. Stk. 4 p.c. Std.	140—150	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	90—95	...	...
114,000	,,	Aug. 8	5	5	Preston 5 p.c. Pref.	100—105*	−2	...
686,319	,,	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	75—80*	...	...
889,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	76—81	...	...
150,000	10	Apl. 4	6	6	San Paulo 6 p.c. Pref. ...	7—7½	...	...
1,786,968	Stk.	Apl. 4	6	6	Sheffield Cons.	108—112e	...	...
96,000	,,	July 18	4	4	Do. 4 p.c. Deb.	90—94e	...	...
133,201	,,	Feb. 29	8½	5	Shrewsbury 5 p.c. Ord. ...	110—115	...	...
90,000	10	June 6	†5	†5	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	5	South Met. Ord.	115—118*	−4	115½—118
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	130—135*	+2½	130—132½
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	75—80	...	78⅛
1,000,000	,,	July 18	4	5	Do. 5 p.c. Red. Deb.	106—113	−1	112½—113⅜
91,500	,,	Feb. 29	8½	8½	South Shields Con.	129—131d	...	...
1,543,795	,,	Aug. 8	6⅔	6	South Suburban Ord. 5 p.c.	115—120*	−1	116—117½
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	108—113*	−1	...
668,337	,,	June 20	5	5	Do. 5 p.c. Deb.	116—121	...	119½—120
647,740	,,	Feb. 29	5	5	Southampt'n Ord. 5 p.c. max.	95—100	...	...
121,275	,,	June 20	4	4	Do. 4 p.c. Deb.	90—95	...	...
200,000	,,	June 20	6½	6½	Swansea 6⅔ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Aug. 8	6⅔	6⅔	Tottenham and District Ord.	127—132*	−1	127½—129½
300,000	,,	,,	5⅛	5⅛	Do. 5⅛ p.c. Pref. ...	114—119*	−1	115—117½
199,005	,,	June 20	4	4	Do. 4 p.c. Deb. ...	91—96	...	91—95
85,701	,,	Apl. 4	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	70—75	...	...
346,069	,,	Feb. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	128—133	...	130½
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	100—105	...	108
1,322,220	,,	July 4	7	7	Wandsworth Consolidated	135—140	...	136—138
971,373	,,	,,	5	5	Do. 5 p.c. Pref.	109—114	...	...
1,167,964	,,	June 20	5	5	Do. 5 p.c. Deb.	115—120	...	116
158,400	,,	Feb. 29	5	6g	Winchester W. & G. 5 p.c. Con.	100—105	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

SCHOOL FOR THE BLIND

(Founded 1838).

Swiss Cottage, LONDON, N.W.3

DO YOU WANT CHEAP THERMS?

THE "P-M" WILL MAKE THEM

Write us for testimony from delighted users

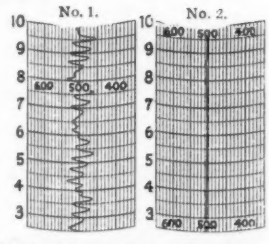
THE "P-M" GAS PLANT, as illustrated, is a Plant which has been specially designed to generate a Semi-Water Gas to blend with straight coal gas, so as to enable the Manager to secure with ease and regularity a uniform gas of his declared calorific value with a correspondingly high increase in the make per ton of coal carbonized.

Features and Advantages

It is a Plant that can easily be regulated to give the correct mixture.
Low in cost and requires no separate Gasholder.
Occupies very little space.
Large saving in coal.
It has low coke consumption.
Its cost is quickly repaid.

Plants already at work and orders in hand:

Bewdley, Birstall, Blaenavon, Cheadle, Chichester, Hollingworth, Mold, New Mill, Ramsey (I.M.), Tamworth, etc.



Calorimeter Control of Mixture

To the advantages of a "P-M" Gas Plant has now been added a Patent device, by means of which the amount of "P-M" gas to be added to the coal gas is automatically controlled by the Calorimeter.

This device is known as "THE TAMWORTH AUTOMATIC CALORIFIC VALUE CONTROLLER."

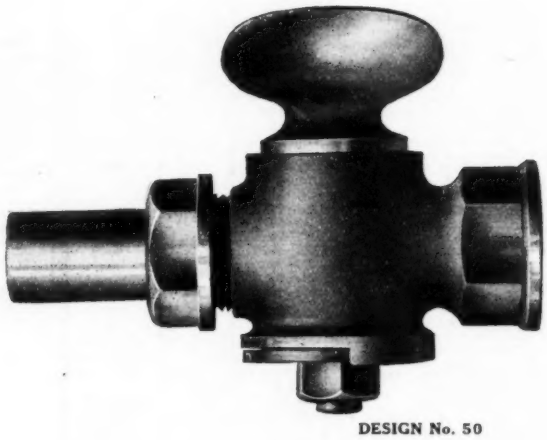
This means that the labour required to work the Plant is confined to charging with Coke and cleaning the fire when required. Chart No. 1 is from the Calorimeter which governs the mixture, and Chart No. 2 is from the Calorimeter on the Town's supply. Automatic, Unique, and delightfully simple.

Full Particulars on Application. *Sole Makers:* *Enquiries will have prompt attention.*

FIRTH BLAKELEY, SONS & CO., LTD.

Vulcan Ironworks, CHURCH FENTON, Yorks.

Quality



DESIGN No. 50

GUN-METAL MAIN COCKS

We shall be pleased to receive enquiries for

SAMPLES & PRICES

GEORGE ORME & CO.

(Branch of Meters Ltd.)

ATLAS METER WORKS
OLDHAM